

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, 2019
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)

Luciano Siani Pires, Chief Financial Officer

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Praia de Botafogo 186 – offices 701 – 1901 – 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 American Depositary Shares (evidenced by American Depositary Receipts), each representing one common share of Vale	VALE	New York Stock Exchange* New York Stock Exchange
6.250% Guaranteed Notes due 2026, issued by Vale Overseas	VALE/26	New York Stock Exchange
8.250% Guaranteed Notes due 2034, issued by Vale Overseas	VALE/34	New York Stock Exchange
6.875% Guaranteed Notes due 2036, issued by Vale Overseas	VALE/36	New York Stock Exchange
6.875% Guaranteed Notes due 2039, issued by Vale Overseas	VALE39	New York Stock Exchange
5.625% Notes due 2042, issued by Vale S.A.	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, 2019 was:
5,128,282,457 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 (§232.405 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 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. We are one of the world's largest producer of iron ore and nickel. We also produce iron ore pellets, manganese ore, ferroalloys, metallurgical and thermal coal, copper, platinum group metals (PGMs), gold, silver and cobalt. We are presently engaged in greenfield mineral exploration in five countries. We operate large logistics systems in Brazil and other regions of the world, including railroads, maritime terminals and ports, which are integrated with our mining operations. In addition, we have a distribution center to support the delivery of iron ore worldwide. Directly and through affiliates and joint ventures, we also have investments in energy and steel businesses.

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 701-1901 – 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

RUPTURE OF THE TAILINGS DAM AT THE CÓRREGO DO FEIJÃO MINE

On January 25, 2019, a tailings dam (“Dam I”) failed at our Córrego do Feijão mine, in the city of Brumadinho, state of Minas Gerais. The rupture released a flow of tailings residue, which affected our administrative area at the Córrego do Feijão mine and parts of the communities of Córrego do Feijão and Parque da Cachoeira outside of Brumadinho, reaching the nearby Paraopeba River. The dam rupture resulted in 270 fatalities or presumed fatalities, and also caused extensive property and environmental damage in the region.

We reaffirm our respect for the victims and their families, and thank the authorities engaged with the search and rescue measures, and those who have dedicated time and effort to provide support and comfort amidst such tragedy. Since the first hours following the rupture of Dam I, we have provided assistance to the victims and impacted families, support to restore the livelihood of the people affected, and means to help them cope with the losses. We have also provided support to local governments and public entities, given the extent of the impacts of the dam rupture and of the suspension of our operations in the region.

Repairing the damage in a fair and agile way is fundamental to the families affected by the rupture of Dam I, and we have prioritized initiatives and resources to that end. Based on open dialogue with the authorities and the affected communities, we developed the Integral Reparation Program, based on social, environmental and infrastructure pillars, to ensure that actions and resources will effectively compensate individuals and communities, recover the environment and enable the sustainable development of Brumadinho and its surroundings.

As we move forward on our path to making our business better, valuing people, safety and reparation, we continue firm in our ambition to become one of the safest and most reliable companies in the world. We will never forget Brumadinho.

Dam I

The Córrego do Feijão mine is part of the Paraopeba complex, in the Southern System. Dam I was first built in 1976 by Ferteco Mineração, a company we acquired in 2001. Dam I received disposed tailings from the Córrego do Feijão and Jangada mines from 1976 until it became inactive in 2016. Dam I contained approximately 11.7 million cubic meters of iron ore tailings.

The dam was raised by building successive layers (lifts) above the tailings accumulated in the reservoir, a technique known as the “upstream” method. There are two other raising methods, the “downstream” method and the “centerline” method, in which the dam is raised by placing new layers away from the initial dam or on top of it, as opposed to over the accumulated tailings. Each of these methods presents a different risk profile.

Vale’s response

Since the date of the dam rupture, we have focused on (i) providing full and effective assistance to the victims and reparation of the damages, (ii) determining the causes of the rupture of Dam I, and (iii) preventing further accidents through the adoption of improved technical standards and accelerating the decharacterization of our upstream dams in Brazil, in compliance with applicable Brazilian regulations.

(i) Immediate support to victims and families

We have provided humanitarian assistance to victims and families from the very first moments. Immediately following the rupture of Dam I, we contacted the local authorities and activated our Emergency Mining Dam Response Plan (*Plano de Ação de Emergência para Barragens de Mineração* (PAEBM)) to locate and rescue victims and provide immediate aid to affected parties, including employees and members of the community. Support to people affected has been offered on a broad basis, with large teams dedicated to listening to the people affected, recording their emergency requirements, ensuring the immediate assistance and delivering them updates in the fastest way possible. A variety of actions were taken to offer aid and relief to people affected by the rupture of Dam I.

We took measures to mobilize ten hospitals and health units, as well as seven assistance centers to provide emergency healthcare and psychological and social assistance to those in need. More than 14,000 medical and psychological consultations and 185,000 pharmacy items have been provided. We made donations to the families of deceased or missing individuals, to assist them with financial expenses in such a critical moment, regardless any future compensation. Donations were also made, starting a few days after the dam rupture, to those who lived or had business activities or real estates in the Self-Rescue Zone. Basic items, such as water, food and shelter, were made available to the communities in need.

Over 580 million liters of water have been supplied to the population, artesian wells have been drilled and a new water pipeline was built to serve the municipality of Pará de Minas. For people who had to be evacuated from neighborhoods close to the impacted areas, we have provided full support with relocation, temporary or permanent housing and the overall well-being.

We mobilized over 700 professionals, including veterinarians, biologists, technicians and field staff to support the rescue of fauna and mitigate environmental impacts, and provided a hospital and an animal shelter. Over 9,800 animals have been rescued so far, and more than 500 remain under our care.

We have also made financial contributions over R\$400 million to the city of Brumadinho, ten municipalities impacted by suspended mining operations and the state of Minas Gerais. Donations were directed to public entities engaged with the search and rescue efforts, especially the State Fire Department, the State Civil Defense, and the State Military Police. State-of-the-art equipment was bought for the Institute of Forensics of Belo Horizonte.

We have also performed emergency infrastructure works to ensure the fast reestablishment of logistics, such as the installation of the Alberto Flores bridge, which grants safe access to the central area of Brumadinho.

(ii) Reparation and remediation efforts

We have been working with authorities and affected communities to remediate the environmental and social impacts of the rupture of Dam I. In addition to the emergency actions discussed above, we have entered into 27 agreements with authorities, on a variety of matters. Below is a summary of the preliminary agreements we have entered into with public authorities to establish a framework of for indemnification and reparation measures:

- *Preliminary settlement agreement with the Brazilian Federal Government, the state of Minas Gerais and public prosecutors.* In February 2019, we entered into a preliminary settlement agreement with the state of Minas Gerais, the Federal Government, public prosecutors of the state of Minas Gerais, federal prosecutors, public defenders of the state of

Minas Gerais and other public authorities. Under this agreement, we committed to make monthly emergency aid payments to residents of Brumadinho and the communities located downstream of Dam I, up to one kilometer from the Paraopeba riverbed, from Brumadinho to the city of Pompéu for one year, retroacting to January 2019. In October 2019, we entered into a new agreement to extend payments for 10 months, with a narrower scope. The total amount paid as emergency aid pursuant to these agreements will be deducted from an eventual collective damages payment to be agreed in the future.

- *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 permit those affected by the dam rupture to join individual or family group out-of-court settlement agreements for the indemnification of property, and other economic and personal damages (*danos morais*) sustained by affected persons. This agreement establishes the basis for a wide range of indemnification payments. As of March 31, 2020, we entered into 2,267 indemnification agreements with individuals or groups, corresponding to 4,898 beneficiaries, providing for payments in the amount of approximately R\$857 million.
- *Settlement agreement with public labor prosecutors.* In July 2019, we entered into a final settlement agreement with the public labor prosecutors to indemnify workers who were based at Córrego do Feijão mine or were otherwise victims of the dam rupture. The settlement agreement established standards to indemnify the families of the workers and also provides for employment stability to our employees and outsourced workers, whose workplace was the Córrego do Feijão mine on the day of the dam failure, and to the survivors who were working at the Córrego do Feijão mine at the moment of the dam failure, for the period of three years from the date of the dam rupture, with the possibility of conversion of this stability right into the proportional amount of money that these employees and outsourced workers would have received until the date of completion of such three-year period (i.e. January 25, 2022). Spouses or companions and parents of deceased workers will be granted lifetime health insurance and children of deceased workers will be granted health insurance, until the age of 25. As of March 31, 2020, we entered into 615 indemnification agreements with individuals or groups pursuant to this settlement agreement, corresponding to 1,578 beneficiaries and 244 families of deceased workers, providing for payments in the total amount of approximately R\$1,007 million. The settlement agreement also provided for the payment of R\$400 million as collective moral damages (*danos morais coletivos*), which we fully paid in 2019. Finally, the settlement agreement determined the release of R\$1.6 billion initially blocked from us.
- *Environmental remediation and compensation.* Between February 2019 and February 2020, we entered into 12 agreements with public authorities, relating to environmental matters and providing for specific remediation and compensation measures, including, among other actions, emergency measures relating to domestic and wild fauna affected by the rupture of Dam I, and actions to restore water collection at the Paraopeba River, improve water collection points around the area affected by the dam rupture, and monitor the water quality in the Paraopeba River and São Francisco River Basin. We also launched the "Ground Zero Project", a pilot project for environmental recovery.
- *Other agreements.* We entered into 12 other agreements with authorities to cover specific topics, such as: (i) support to the municipalities in providing public services and infrastructure; (ii) emergency payments to families relocated in Barão de Cocais and for the Pataxós indigenous community; and (iii) external audits and asset integrity studies, providing

technical support for the authorities, with measures to review and reinforce structures and suspension of operations.

- *Other negotiations.* In addition, we are negotiating with the Government of the State of Minas Gerais and public authorities that are part of the task force group constituted to investigate the failure of Dam I an additional agreement regarding collective damages indemnification and further compensation for the society and environment, with the goal of creating a stable legal framework for the execution of reparation and compensation measures. Based on the current terms under early-stage discussions and preliminary estimates, this agreement could result in an additional provision ranging from US\$ 1.0 billion to US\$ 2.0 billion. Accounting impacts, if any, will be recorded when an agreement is reached.

Based on the dialogue with impacted communities and with authorities, we have developed a comprehensive program to repair the damage caused, encompassing economic measures already included in legal agreements as well as non-economic compensation measures.

On the environmental front, a plan was developed to remove and treat tailings, recover fauna and flora and ensure the water catchment and supply to the Belo Horizonte metropolitan region. Two water treatment stations (ETAF) are already operating to clean and return treated water to the Ferro-Carvão stream and the Paraopeba river. The "Ground Zero Project" is a pilot project to fully recover the original conditions of the Ferro-Carvão stream by 2023.

On the socio-economic front, non-economic compensation measures aim to ensure respect for human rights and are being negotiated, focused on the perspectives and demands of the affected communities and public authorities. Our initiatives are being designed to provide structured assistance for long-term results in education, healthcare and well-being, employment and income generation, ultimately enabling sustainable development in the region. Some initiatives in place welcome residents of Brumadinho to share their experiences and feelings, with a view to rebuilding self-esteem and strengthening the sense of belonging to that community and location. Activities are also developed to enhance local vocations, such as cultural tourism, productive backyards, community gardens and handicrafts.

We know that there is still a lot to be done to fully restore Brumadinho and reaffirm our commitment to doing so. For further information on the updated balance of our actions taken so far, see the following website: vale.com/repairoverview. Information on our website is not incorporated by reference in this annual report on Form 20-F.

(iii) Determination of the causes for the rupture of the dam

Immediately after the dam rupture, our external legal advisors engaged an expert panel to conduct an investigation into the causes of the dam rupture. On December 12, 2019, the expert panel released its report on the technical causes of the rupture of Dam I.

- The panel found that the rupture and resulting flow slide was the result of flow (static) liquefaction within the tailings in the dam.
- According to the panel's report, the following factors contributed to instability in Dam I: (i) a design that resulted in a steep upstream constructed slope; (ii) water management within the tailings impoundment that at times allowed ponded water to get close to the crest of the dam, resulting in the deposition of weak tailings near the crest; (iii) a setback in the design that pushed the upper portions of the slope over weaker fine tailings; (iv) a lack of significant

internal drainage that resulted in a persistently high water level in the dam, particularly in the toe region; (v) high iron content of tailings, resulting in heavy tailings with bonding between particles, which created stiff tailings that were potentially very brittle if triggered to become undrained; and (vi) high and intense regional wet season rainfall that can result in significant loss of suction, producing a slight loss of strength in the unsaturated materials above the water level.

- We are evaluating the potential effect of the factors identified by the expert panel on our determinations about safety and stability at our other structures, particularly upstream tailing dams.

Our Board of Directors also established, immediately after the dam rupture, three independent ad hoc advisory committees to support the Board in matters relating to the dam rupture: the Independent Ad Hoc Consulting Committee for Investigation (CIAEA), the Independent Ad Hoc Consulting Committee for Support and Recovery (CIAEA-R) and the Independent Ad Hoc Consulting Committee for Dam Safety (CIAESB).

- The Independent Ad Hoc Consulting Committee for Investigation (CIAEA) was established to conduct an independent investigation into the causes of the dam rupture and to advise our Board of Directors in connection with these matters. The committee was chaired by Dr. Ellen Gracie, former Justice of the Federal Supreme Court (STF). On February 20, 2020, the CIAEA provided its investigation report to our Board of Directors. An executive summary of the report was published the same day. The committee reported on its investigation, provided its observations and, based on its observations, made recommendations concerning our controls and governance, changes in our internal organization, our culture, and our ability to identify risks and take action to address them. Because the committee investigated the circumstances that existed prior to the rupture of Dam I, some of the actions we have taken since then may address aspects of the committee's recommendations, but we are in the process of evaluating the committee's report. On March 20, 2020, we announced a detailed plan with deadlines for the implementation of measures to address the committee's recommendations. There can be no assurance that the measures we have taken or will take, including in response to the committee's recommendations, will be effective to prevent future accidents.
- The Independent Ad Hoc Consulting Committee for Support and Recovery (CIAEA-R) was established to monitor our measures to support the affected community and to remediate the impacted area, and our provision of resources for this purpose, and to recommend measures to our Board of Directors in connection with these matters. On February 20, 2020, the committee provided its investigation report to our Board of Directors. The report recognizes that we have made significant efforts for the reparation since the rupture of Dam I, but also indicates that there are challenges for the evolution of the reparation process. The report provides recommendations to the Board of Directors with respect to the improvement and monitoring of our action plans, and technical and operational suggestions to our management to contribute to the effective fulfillment of the action plans.
- The Independent Ad Hoc Consulting Committee for Dam Safety (CIAESB) was established to monitor safety initiatives, risk management and risk mitigation efforts related to our dams and recommending measures to strengthen safety at these dams. In March 2020, our Board of Directors decided to extend the term of the committee for one year.

(iv) Prevention of further accidents and decharacterization of upstream dams

In April 2019, we created a special department in charge of reparation and development (*Diretoria Especial de Reparação e Desenvolvimento*). This department is responsible for all social, humanitarian, environmental, and structural recovery actions to be carried out in Brumadinho and in the 22 municipalities along Paraopeba river up to Retiro Baixo dam in the state of Minas Gerais, and the coordination of actions with communities in the Self-Rescue Zone and Secondary Safety Zone of the dams. The head of the department reports to our CEO and participates in weekly meetings of our management to report and discuss the progress of the initiatives.

In January 2019, we decided to accelerate our plan to “decharacterize” all of our dams located in Brazil built using the upstream raising method. Following the announcement of our decision, the Brazilian National Mining Agency (“ANM”) approved new safety standards for dams and required the decharacterization of structures built under the upstream method. Our plan aims to decharacterize dam structures in accordance with new federal and state regulations (ANM Regulation no. 13/2019 and the Minas Gerais State Law no. 23.291/2019). The term “decharacterization” means reintegrating the dam and its contents into the local environment.

We have been working to develop a detailed engineering plan to decharacterize each of those upstream dams. The updated plan for each structure takes into consideration whether downstream containment structures should be built, depending on the level of safety of the structure. As of December 31, 2019, we recognized provisions in connection with the decharacterization of dams in the aggregate amount of US\$2.625 billion.

In December 2019, we concluded the decharacterization of the 8B dam in the city of Nova Lima and the construction of a containment structure for the Sul Superior dam in the city of Barão de Cocais. We expect to conclude the downstream containment structures for B3/B4 and Forquilha I, Forquilha II and Forquilha III dams in the first half of 2020.

In 2019, due to the ANM’s technical reevaluation of the construction methods of our dams and other structures, we included additional dams in our decharacterization plan. Additionally, smaller dikes that were raised through the upstream method and drained stacking, that are now required to comply with the requirements imposed by the ANM, will also be decharacterized.

We are currently working on the improvement of engineering solutions to decharacterize all of these structures. These projects are subject to further review and eventual approval by the relevant authorities. The costs and provisions associated with the decharacterization of our upstream dams and structures are based on several assumptions and estimates that depend, in part, on factors that are beyond our control.

We also operate tailings dams outside of Brazil (Canada and New Caledonia), including compacted outer shell upstream dams in Canada. We are not planning to decharacterize these upstream dams, as decharacterization is not required or contemplated under local regulations.

Impacts of the rupture of Dam I on Vale

The impacts of the dam rupture on our operations and results of operations were very significant, but their full scale and scope remain uncertain. Some of the major impacts are described below.

(i) Impacts on our financial performance and results of operations

The rupture of Dam I had an extensive impact on our financial performance and results of operations as of and for the year ended December 31, 2019. The main impacts in our income statement for the year ended December 31, 2019 was (i) US\$7.402 billion, including expenses and provisions to meet our obligations in connection with the decharacterization of our upstream dams and the obligations we assumed in preliminary settlement agreements, and (ii) a loss of US\$235 million in the “impairment and disposal of non-current assets” attributable to the write-off of the Córrego do Feijão mine and other upstream dams. See *Operating and Financial Review and Prospects—Overview—Rupture of Dam I*.

(ii) Liabilities and legal proceedings

Our potential liabilities resulting from the dam rupture are significant. We are continuously evaluating these contingencies and may recognize additional provisions in the future. We are already subject to several legal proceedings and governmental investigations relating to the rupture of Dam I, and we expect to face other such proceedings and investigations. For additional information regarding the legal proceedings relating to the rupture of Dam I, see *Additional Information—Legal proceedings*. We will continue to cooperate fully with the authorities and support the investigations into the dam rupture, and will also contest any proceedings that we believe are unjustified.

As of December 31, 2019, we recognized provisions in the total amount of US\$3.925 billion related to preliminary settlement agreements with authorities for compensation to affected persons and communities, donations and projects to restore the environment, including (i) US\$2.735 billion in connection with social and economic compensation and (ii) US\$1.190 billion in connection with environmental restoration and compensation. Our potential liabilities resulting from the dam rupture are significant, and additional provisions might be expected.

(iii) Suspension of operations

Following the dam rupture, we have suspended various operations, either voluntarily or as a result of revocation of licenses or court orders. The suspension of operations in its most critical level totaled 92.8 million metric tons per year of production capacity, but part of these operations resumed during 2019. Additional operations may be suspended as a result of new laws and regulations relating to the use of dams, or our inability to obtain the required licenses or the stability reports required by applicable regulations, as discussed below.

Below is a summary of operations suspended since the date of the dam rupture.

- *Southern System*: In addition to Córrego do Feijão and Jangada mines, which were directly affected by the rupture of Dam I, we temporarily suspended operations at the entire Vargem Grande and Fábrica complexes in February 2019. In July 2019, the ANM authorized the partial resumption of dry processing operations at the Vargem Grande complex, which enabled 5.0 million metric tons of additional production in 2019, which represents 12.0 million metric tons per year of production capacity.
 - *Vargem Grande*—We expect operations at the Vargem Grande pellet plant to resume in the third quarter of 2020. The pellet feed for pellet production is expected to be sourced from the site’s beneficiation plant, which will require tailings disposal at the Maravilhas I dam and Cianita waste dump until the start-up of the Maravilhas III dam, which is expected to occur in the last quarter of 2020. In

order to resume operations at the pellet plant, we will need to run trigger tests, which require approval by an external audit of the state prosecutors of the state of Minas Gerais (MPMG). In order to restart the Vargem Grande beneficiation plant and its economic mining plan, we will need to obtain approval from the ANM.

- *Fábrica*—We expect operations at the Fábrica complex to resume in the second quarter of 2020. In order to resume operations, we will need to run vibration trigger tests to certify the absence of impacts to the site’s structures, which require the approval from the ANM and by the external audit to be conducted by the MPMG. We expect to operate using wet processing with tailings disposal at the Forquilha V Dam starting in the third quarter of 2020.
- *Southeastern System*: Our operations at the Timbopeba mine are suspended, while the Alegria and Brucutu mines are partially operating.
 - *Brucutu*—Our operations at the Brucutu mine were suspended in February 2019, resumed in June 2019, and subsequently partially suspended in December 2019 while we assess the geotechnical characteristics of the Norte Laranjeiras dam. We have extended the suspension of tailings disposal while a geotechnical assessment of the structure’s conditions is being conducted. The findings of the assessment will determine the corrective actions, if any, to resume tailings disposal at the Norte Laranjeiras Dam. As a result, the Brucutu plant will continue to operate with approximately 40% of its capacity, while utilizing wet processing with tailings filtration, with the impact of the partial suspension being estimated at approximately 1.5 million metric tons per month. As of the March 31, 2019 deadline under applicable regulations, we did not obtain a certification of stability (“DCE”) for the Norte Laranjeiras dam. Our geotechnical and operational teams are testing short-term alternatives for tailings disposal, such as the optimized use of the Sul dam, which may restore the Brucutu plant’s processing capacity to 80%.
 - *Alegria*—Our operations at the Alegria mine were suspended by the ANM in March 2019 but, in November 2019, the ANM reversed its decision, authorizing us to resume production of approximately 8 million metric tons of iron ore per year of production capacity.
 - *Timbopeba*—We expect to receive the necessary authorization from the MPMG to restart operations at the Timbopeba site using dry processing in the first half of 2020, after the evaluation of the external audit by the MPMG. We expect wet processing activities at the Timbopeba mine to resume in the last quarter of 2020, following the completion of a pipeline to dispose tailings at the Timbopeba pit. We are evaluating alternatives to resume wet processing sooner.

(iv) New regulations

Various governmental authorities have approved or proposed new regulations relating to licensing, use and operations of dams in response to the Dam I rupture. Additional rules imposing restrictions on mining operations and ancillary activities are expected. Also, new taxes, contributions or other obligations may be imposed on us as a result of the rupture of Dam I or its direct or indirect impacts. These rules may affect not only our iron ore operations, but also our base metals operations in Brazil and other operations that rely on dams.

- *Minas Gerais state law on licensing of dams.* A statute approved by the state of Minas Gerais in February 2019 prohibits the increase, modification or construction of any upstream dam, and provides for the full decharacterization of any upstream dam by February 2022. The statute also prohibits the increase, modification or construction of any dam if communities are established within its Self-Rescue Zone (*Zona de Autossalvamento* or “ZAS”), 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. Although this statute permits the construction of new dams and the use of existing dams built using other techniques, it imposes significant restrictions on them as well. As a result, we may not be able to rely on tailings dams for new projects and expansion of existing operations.
- *ANM rules.* In 2019, the ANM, Brazil’s national mining agency, issued resolutions on dam safety requiring companies that own upstream dams to submit a technical decharacterization project by August 2019 and to fully decharacterize these upstream dams following certain timetables based on the volume and the characteristics of the dam. In addition, the resolution requires the decharacterization of our facilities located within the Self-Rescue Zone of a tailings dam.
- As a result of new regulations, the licensing process for our operations may become longer and more uncertain, and our costs of monitoring and compliance are expected to increase. These additional laws and regulations may impose restrictions on our operations, require additional investments or eventually require us to suspend additional operations.

We will need to rely on alternative methods to continue operating certain of our mines and plants, particularly those that rely on tailings dams. We have approved projects and further studies are in progress, to apply a residue disposal technology that consists of filtering and stacking of partially or totally dewatered tailings, which will reduce our reliance on tailings dams in the medium and long term. These alternative technologies will cause an increase in our production costs and require additional investments in our mines and plants.

(v) Impact on reserves

Our reported reserves have been affected by the ongoing investigations and legal proceedings involving the use of dams in our mining operations and by the new rules relating to licensing, use and operations of dams, which were adopted in response to the Dam I rupture. See *Information on the Company—Reserves*. These proceedings and regulations may impact our iron ore reserves and reserves for other products for which the production process involves dams.

(vi) Uncertainties arising from increased safety requirements and external expert certification

We are required to obtain a certification of stability (Stability Condition Statement, or “DCE”), which is provided by external experts following an audit, for most of our dams in Brazil in six-month intervals by March 31 and September 30 of each year, and for some, on an annual basis. Brazilian state and federal authorities are strengthening regulations on dam safety. External experts may be unwilling to provide these reports and certificates as a result of the uncertainties regarding the causes of the Dam I rupture, the increasing risk of liability, and uncertainties concerning the interpretation of new regulations. If any of our dams is unable to comply with safety requirements, we may need to suspend related operations, evacuate the area surrounding the dam, relocate communities and take other emergency actions.

In January 2020, we implemented the role of Engineer of Record (“EoR”) as an additional step in the assessment of our structures in Brazil. Among its duties, the EoR is responsible for carrying out regular dam safety inspections, as well as the issuance of monthly technical reports. The EoR is integrated with our lines of defense and senior management level, and not part of our operations, so as to have the requisite authority for this type of role. In this model of continuous supervision, if a change in the stability of any of our structures is identified, a new audit process may be initiated to obtain a DCE at any point in the year.

- In September 2019, we obtained DCEs for 82 of our operational structures in Brazil and did not obtain DCEs for 18 structures, including upstream dams that are being decharacterized, and other structures that are undergoing additional studies and works. The operations of these 18 structures have been suspended, and we have followed the emergency plans for each of them.
- In 2019, we started emergency actions after an external consultant revoked a stability report relating to the Sul Superior dam at our Gongo Soco mine (in the Minas Centrais complex in the Southeastern System), in Barão de Cocais, Minas Gerais. As a result, we relocated about 500 residents of the Socorro, Tabuleiro and Piteiras neighborhoods of Barão de Cocais in the downstream area of the Sul Superior tailings dam. The Sul Superior dam has been inactive since April 2016, when we suspended iron ore production at the Gongo Soco mine. As an additional safety measure, we intensified inspections of the Sul Superior dam, installed new monitoring equipment and engaged additional consultants to perform a new safety assessment. In addition, based on the Emergency Action Plan for Mining Dams (PAEBM) for the B3/B4 dam at the Mar Azul mine, in the city of Nova Lima, Minas Gerais, we relocated about 200 people from the Macacos neighborhood in the downstream area of the B3/B4 tailings dam, which has been inactive.
- On September 30, 2019, following an auditing process, external auditors renewed the certification of stability (Stability Condition Statement, or DCE) for 82 of our operational structures. We were not able to renew the DCE for the following structures: Pontal System, Campo Grande, Doutor, Marés II, VI, Sul Inferior, Maravilhas II, Dique B, Capitão do Mato, Vargem Grande, Capim Branco, Captação de Água do Igarapé Bahia, Forquilha II, Grupo, Sul Superior, B3/B4, Forquilha I and Forquilha III.
- After September 30, 2019, the Itabiruçu, Santana and Norte/Laranjeiras dams also had the emergency level triggered due to operational conditions and further investigations, but these structures did not lose their DCEs.
- In October 2019, we identified some anomalies during a routine inspection in Forquilha IV dam. As a result the DCE for this dam has been withdrawn. The Forquilha IV dam has not received tailings since February 2019.
- In February 2020, we activated level 2 of the Mining Dams Emergency Action Plan (PAEBM) of the Capitão do Mato Dam, at the Capitão do Mato mine, in Nova Lima (MG). As a result, we evacuated all people in the Self-Rescue Zone of this dam, as a preventive measure due to the volume of rainfall recorded in the region, higher than the historical average.
- On March 31, 2020, after the EoR’s assessment, we obtained DCEs for 78 of our operational structures in Brazil. Nine dams at emergency levels 2 and 3 of the Mining Dams Emergency Action Plan (PAEBM) were not granted a DCE. We had already evacuated people in the Self-Rescue Zone of these dams, with the exception of the Doutor dam, for which the Self-Rescue Zone evacuation plan was initiated in February 2020 and will be concluded by

the end of April 2020. Seventeen other structures, all currently inactive, did not obtain DCEs. We are not required to evacuate people in the Self-Rescue Zone of these 17 structures, as they are classified as emergency level 1 of the PAEBM.

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,					
	2019		2018		2017	
	(US\$ million)	(% of total)	(US\$ million)	(% of total)	(US\$ million)	(% of total)
Ferrous minerals:						
Iron ore	23,343	62.1%	20,354	55.7%	18,524	54.5%
Pellets	5,948	15.8	6,651	18.2	5,653	16.7
Ferroalloys and manganese	282	0.8	454	1.2	469	1.4
Other ferrous products and services	432	1.1	474	1.3	483	1.4
Subtotal	30,005	79.9	27,933	76.4	25,129	74.0
Base metals:						
Nickel and other products(1)	4,257	11.3	4,610	12.6	4,667	13.7
Copper(2)	1,904	5.1	2,093	5.7	2,204	6.5
Subtotal	6,161	16.4	6,703	18.3	6,871	20.2
Coal	1,021	2.7	1,643	4.5	1,567	4.6
Other	383	1.0	296	0.8	400	1.2
Total net operating revenues from continuing operations	37,570	100%	36,575	100%	33,967	100%

(1) Includes nickel coproducts (copper) and byproducts (precious metals, cobalt and others).

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

Ferrous minerals:

- *Iron ore and iron ore pellets.* We operate four systems in Brazil for producing and distributing iron ore, which we refer to as the Northern, Southeastern, Southern and Midwestern Systems. Each of the Northern and the Southeastern Systems is fully integrated, consisting of mines, railroads, maritime terminals and a port. The Southern System consists of two mining complexes and two maritime terminals. We also have iron ore pellet operations in several locations, some of which are conducted through joint ventures. We currently operate eleven pellet plants in Brazil (four of these plants are currently suspended), and two in Oman. We also have a 50% stake in Samarco Mineração S.A. ("Samarco") and 25% stakes in two pellet companies in China.
- *Ferroalloys and manganese.* We conduct our manganese mining operations through Vale S.A. and subsidiaries in Brazil, and we produce several types of manganese ferroalloys through a wholly owned subsidiary in Brazil.

Base metals:

- *Nickel.* Our principal nickel mines and processing operations are conducted by our wholly owned subsidiary Vale Canada Limited ("Vale Canada"), which has operations in Canada,

Indonesia and New Caledonia. We also have nickel operations in Onça Puma, in the Brazilian state of Pará. We also control and operate nickel refining facilities in the United Kingdom, Japan and China, and have interests in a nickel refinery in South Korea.

- *Copper.* In Brazil, we produce copper concentrates at Sossego and Salobo, in Carajás, in the state of Pará. In Canada, we produce copper concentrates, copper matte and copper cathodes in conjunction with our nickel mining operations at Sudbury and Voisey's Bay.
- *Cobalt, PGMs and other precious metals.* We produce cobalt as a byproduct of our nickel mining and processing operations and refine it at our Port Colborne facilities, in the Province of Ontario, Canada. We produce refined cobalt in our Long Harbour facilities in Newfoundland and Labrador. We also produce cobalt as a byproduct of our nickel operations in New Caledonia. We produce PGMs as byproducts of our nickel mining and processing operations in Canada. The PGMs are concentrated at our Port Colborne facilities. We produce gold and silver as byproducts of our nickel mining and processing operations in Canada, and gold as a byproduct of our copper mining at Sossego and Salobo in Brazil.

Coal:

- We conduct our coal operations in Mozambique, through our subsidiary Vale Moçambique S.A. ("Vale Moçambique"), where we are ramping up our metallurgical and thermal coal operations.

Logistics infrastructure:

- We are a leading operator of logistics services in Brazil and other regions of the world, with railroads, maritime terminals, distribution centers and ports. Two of our four iron ore systems include an integrated railroad network linked to port and terminal facilities. We also have an interest in MRS Logística S.A. ("MRS"), which transports our iron ore products from the Southern System mines to our maritime terminals, and VLI S.A. ("VLI"), which provides integrated logistics solutions to general cargo through railroads, inland and maritime terminals in Brazil. We operate the logistics infrastructure to support our coal operations in Southeastern Africa. We charter dry bulk vessels to transport the products that we sell on a cost and freight ("CFR") basis to our customers.

BUSINESS STRATEGY

2019 was a very challenging year for us. We know that there is much to be done to address the effects of the rupture of Dam I at the Córrego do Feijão mine. We will manage the liabilities arising from this deeply regretted event, and we are committed to learning and sharing the lessons from the dam rupture. With this purpose, we are dedicated to going beyond our commitment to restore Brumadinho and to build a better Vale, based on the following main pillars:

- Safety and operational excellence.
- New pact with society.
- Maximize flight-to-quality in iron ore.
- Base metals transformation.
- Discipline in capital allocation.

Below are the highlights of our major business strategies.

Safety and operational excellence

We are fully committed to addressing the effects of the rupture of Dam I, with three key initiatives: (i) assistance to victims and recovery of the affected areas, (ii) determination of the causes of the dam rupture, and (iii) prevention of further accidents through adoption of the highest technical standards and accelerated decharacterization of all upstream dams.

In 2019, we created a new position on our Board of Executive Officers, for an executive officer for Safety and Operational Excellence, who leads a department in charge of: (i) enhancing risk governance and information flow, (ii) acting as second line of defense and defining technical standards and risk acceptance criteria applicable to personnel whose activities are related to strategic assets, performance monitoring and definition of technical competences, and (iii) monitoring risk management. This new Executive Office is composed of four technical teams: Tailings, Asset Integrity, Operational Excellence and Health, Safety and Operational Risks. One of the main responsibilities of the Health, Safety and Operational Risks team is a new structured process for hazard identification and risk assessment (HIRA) in all of our operations, developing a tailings management system in line with the best international practices and consolidating our management system (Vale Production System), which was revised and relaunched with more than 60,000 people trained in 2019 as a means to support the ongoing safety cultural transformation within Vale. We continue to make every effort to provide relief and support to those affected by the dam rupture and to restore the trust of our stakeholders on us. We are committed to rebuilding our reputation in Brazil and in the global mining industry.

New pact with society

We are committed to a comprehensive approach towards sustainability and safety, establishing a positive social, economic and environmental legacy in the places where we operate and going beyond taxes, social projects and reparation in Brumadinho. See *Overview—Business overview—Our environmental, social and governance (ESG) framework*. In 2019, we revised the sustainability goals that we had established in 2018 in line with the Sustainable Development Goals (SDG) of the United Nations 2030 Agenda, to adopt more ambitious goals. Below is a list of our new “2030 Commitments”:

- *Energy*—The three pillars of our energy initiatives are: (a) self-sufficiency, (b) energy efficiency and (c) energy matrix transformation. Approximately 60% of the electricity consumed by our operations in Brazil is self-generated energy that comes from renewable sources. By 2025, we intend to reach 100% of self-generation from renewable sources in Brazil, and by 2030 we intend to reach this goal globally.
- *Forest Protection*—One of our main initiatives related to biodiversity involve the rehabilitation of areas with the purpose of restoring previously existing native habitats and recovering important ecosystems. We are committed to recovering and protecting 500,000 hectares of degraded land beyond our boundaries by 2030.
- *Climate Change*—Fighting the causes of climate change is one of our main goals. In 2012, Vale set a goal to reduce direct emissions by 5% by 2020. This goal was reached in 2017. In 2019, we established more ambitious goals relating to climate change risk management, which include a commitment to reduce greenhouse gas emissions in line with the Paris Agreement by 2030, and become carbon neutral by 2050.

- *Environmental, Social and Governance (ESG) Gaps*—Since 2018, we have been increasing our engagement with key ESG stakeholders and mapping our main ESG gaps against best practices. We are committed to eliminating our ESG gaps by 2030. Our main initiatives are detailed in an action plan available on our website, and include, among other initiatives: (a) achieving a new target relating to gender balance; (b) obtaining ISO 14001 certification for all operations, (c) establishing an audit committee, (d) establishing a human rights due diligence process, (e) structuring social key performance indicators (KPIs) with short, medium and long term goals, and (f) establishing long-term compensation with correlation to ESG metrics.

Maximize flight-to-quality in iron ore

In the iron ore business, we are committed to delivering the highest possible margins under the current circumstances, by managing our extensive supply chain and flexible product portfolio to cope with production constraints in the short-term. We will constantly seek better price realization, based on adjustments to our product portfolio according to market demand and supply chain optimization. We are focusing our product line to capture industry trends, improving quality and productivity, controlling costs, strengthening our logistics infrastructure of railroads, ports, shipping and distribution centers, and strengthening relationships with customers. Our diversified portfolio of high-quality products, strong technical marketing strategy, efficient logistics and long-standing relationships with major customers will help us overcome the immediate challenges and achieve this goal.

With the continuous increase of the share of dry processing production to 60% in 2018 from 40% in 2014, and aimed at 70% by 2023, our reliance on new dams and dam raisings is declining. To treat the tailings from wet processing, we are investing in studies and new technologies with a view to allowing us to operate certain of our mines and plants without having to rely on the use of tailings dams. We have announced an estimated investment of US\$1.8 billion between 2020 and 2024 in some of our sites, including Cauê, Conceição and Brucutu Mines, to be operated with dry stacking waste disposal technology, which consists of filtering and stacking of partially or totally dewatered tailings, reducing our reliance on tailings dams in the medium and long term. In line with this goal, we acquired New Steel in January 2019, bringing in innovative technologies for the dry beneficiation of iron ore. We also announced an investment of US\$100 million in the world's first industrial-scale dry magnetic fines concentration to produce 1.5Mt starting in 2022.

We will continue to promote the Brazilian blend fines (BRBF), a product standard with silica (SiO₂) content limited to 5% and lower alumina (1.5%), offering strong performance in any kind of sintering operation. We produce BRBF by 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, but also low concentration of alumina. It is produced in our Teluk Rubiah Maritime Terminal in Malaysia and in seventeen 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. The blending strategy also permits the use of iron ore with lower 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 and reduce the use of water in our operations: a key flexibility to cope with the short-term challenges.

We continue to improve our portfolio in order to provide solutions to our customers and to adapt to potential market demands. In 2019, we announced the launch of the GF88, a new product to supply the growing market of pellet production in China. This product consists of Carajás fines (IOCJ), obtained through a grinding process, opening a new market for our high quality portfolio. We are currently evaluating the development and production of metallic products (e.g. "green" pig iron and hot

briquetted iron) along with customers as an addition to our portfolio. Metallics are steel raw material products containing a high percentage of metallic iron, which can support the steel industry in its challenge to reduce carbon emission, fulfilling its quality requirements with less capex, while using more advanced technologies.

Base metals transformation

In view of a potential trifurcation in nickel markets, into stainless steel (Class II), electric vehicle battery (nickel sulphate) and high value applications (Class I) markets, we are adopting a new commercial strategy for our nickel business, which includes (a) preserving and restoring our market share in the high value segments, through a recovery of our market share in the Upper Class 1 nickel market (nickel alloys) and an increase of our presence in the Lower Class 1 nickel markets, and (b) maintaining our product portfolio optionality for a potential surge in electric vehicle battery demand, through our continuous presence in the Class 2 ferronickel market globally, and a reduction in our exposure to intermediate products.

A key aspect of the strategy for our nickel business is to complete its turnaround, continuing to review our asset utilization, optimizing our operations and focusing 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-cost operations, a substantial resource base and diversified mining operations that produce nickel from nickel sulfide and laterite sources using advanced technology. Our commercial footprint is global, with a focus on serving our customers directly.

A key aspect of our strategy for our copper business is to improve efficiency and asset utilization in the Carajás region in Brazil while we also evaluate opportunities to increase copper production in Canada. We have plans to develop a multi-year copper expansion plan, with Salobo III in the Carajás region being the first approved project in the pipeline. Commercially, we plan on redirecting our copper concentrate sales to the Pacific region in order to align with global copper demand.

Below is a list of actions we are taking, which are consistent with our turnaround strategy for our base metals business:

- Investments in replacement projects in the short term at Sudbury and Voisey's Bay nickel mines;
- Nickel-hedging strategies to guarantee cash flow stability in periods of heavier investments;
- New projects in Indonesia through partnerships and joint-ventures in Sorowako, Bahodopi and Pomalaa;
- Completion of divestments in PT Vale Indonesia Tbk ("PTVI"), in order to meet certain obligations under our amended contract of work and safeguard its extension and our investments in Indonesia;
- Focus on nickel-production reliability in the short term, through improvements in our North Atlantic Canadian operations, our ability to expand our operations in Onça Puma with a second furnace, as well as the above-mentioned projects in Indonesia.

Discipline in capital allocation

We reiterate our strong commitment to a sound balance sheet. In 2019, we continued our deleveraging process and achieved a net debt level of US\$4.880 billion as of December 31, 2019. We will allocate capital in a disciplined way, which will be key to enable us to address the effects of the Dam I rupture. In January 2019, our Board of Directors approved the suspension of our shareholder remuneration policy, so that no payment of dividends or interest on shareholders' equity will be made pursuant to this policy in excess of mandatory payments required by law, and we will not approve any share buyback for the time being. In March 2020, taking into account our strong balance sheet and the need to secure capital funding in light of the increased risks presented by the COVID-19 pandemic, we drew US\$5 billion under our revolving credit lines.

As part of our commitment to discipline in capital allocation and a leaner portfolio, some of our non-performing assets are under scrutiny as we move towards de-risking outside of our core business. As a result, we are implementing the following strategies: (a) a new mining plan and a new plant strategy to achieve a sustainable ramp-up of Moatize, which includes shortening the life of mine and completing a plant overhaul, (b) studying exit alternatives for our operations in New Caledonia, while also considering operational and commercial alternatives to improve the short-term cash flows of Vale New Caledonia ("VNC"), and (c) studying coordinated exit alternatives for steel joint-ventures and other investments outside our core business.

SIGNIFICANT CHANGES IN OUR BUSINESS

We summarize below major events in our business since the beginning of 2019.

Developments relating to the outbreak of the coronavirus

In December 2019, an outbreak of a contagious disease, the Coronavirus Disease 2019 (COVID-19), began in mainland China and has since spread through various countries, including Brazil and Canada, where most of our operations are concentrated. We are complying with the health and safety protocols established by the authorities and agencies of each country in which we operate and are monitoring the developments of the situation closely. In January 2020, we created a crisis management structure and governance to manage and deploy our actions in response to the COVID-19 pandemic. We have taken steps and implemented policies to safeguard our employees, businesses and communities surrounding our operations from the threats posed by the COVID-19 pandemic.

- *Revolving credit lines.* On March 24, 2020, we drew down US\$5 billion under our revolving credit lines maturing June 2022 (US\$ 2 billion) and December 2024 (US\$ 3 billion). In making the decision, we assessed the increased risks presented to our business by the COVID-19 pandemic and concluded that it would be prudent to take advantage of our strong balance sheet to navigate through the next few months with increased cash reserves.
- *Voisey's Bay.* We have ramped down our Voisey's Bay mining operation and placed it on care and maintenance for a period of four weeks, as a precaution to help protect the health and well-being of Nunatsiavut and Innu indigenous communities in Labrador in face of the COVID-19 pandemic. We have taken this preventive action because of the unique remoteness of the area, with fly-in and fly-out operations, and higher exposure to travel. We are working together with the communities and authorities to ensure our operations do not act as a catalyst to inadvertently introduce the virus in these communities.

The Long Harbour Processing Plant (LHPP) continues to operate nickel and cobalt production and, in principle, should not be affected, given the availability of stockpiled concentrates to feed the LHPP well past the four-week care and maintenance period, while copper concentrate production at the site will be reduced proportionally to the period of mine stoppage (Voisey's Bay produced 25kt of copper in concentrate in 2019). The decision also impacts the Voisey's Bay Mine Expansion project currently underway to transition to underground operations.

- *Mozambique Coal Processing Plants.* Due to travel and equipment transportation restrictions resulting from the COVID-19 outbreak, we are revisiting plans for the Mozambique coal processing plant stoppage. The halting of the processing plants' operations was previously expected to start in the second quarter of 2020 and a new date is under evaluation.
- *Home-Office Regime.* On March 16, 2020, the great majority of our employees and third-party employees based in our corporate offices began to work according to a home-office regime. The measure aims to safeguard our employees, reducing the number of people in the same workspace and exposure to public spaces, such as buses, subways and elevators.
- *Test kits and protective equipment in humanitarian aid.* On March 22, 2020, we purchased five million COVID-19 rapid test kits to help the Brazilian government fight the spread of the disease in the country. The amount of test kits purchased by us represents half of the need estimated by the Brazilian Ministry of Health at the moment. We also purchased from our Chinese suppliers personal protective equipment, such as goggles, gloves and medical masks, for doctors and nurses which will also be donated to the Brazilian federal government.
- *Teluk Rubiah Maritime Terminal (TRMT).* On March 24, 2020, we temporarily halted our operations in the TRMT in Malaysia, as we are temporarily unable to secure the minimum resources to safely operate the terminal. During suspension of the operations, vessels heading to TRMT will be redirected and redistributed among our blending facilities in China with no expected impact on production and sales volume in 2020, but with an impact on sales of approximately 500kt in the first quarter of 2020. We also expect some marginal cost increase due to additional logistics.
- *Temporary Aid Package for Suppliers.* On March 24, 2020, we announced a series of aid initiatives for our suppliers during the crisis caused by the coronavirus pandemic. The initiatives include advancing payments to more than a thousand small and medium-sized suppliers in Brazil, reducing payment timeframes for services and materials that are still to be invoiced by approximately 3,000 small and medium-sized suppliers, and providing financial support to construction companies and workers allocated to projects which are being halted by us, in order to reduce the flow of people in our sites and increase the safety of our employees and outsourced workers, and to concentrate resources on essential activities for the country at this moment. There will be no impact on our works related to dam safety. We estimate that through these measures we will inject about R\$ 160 million into the Brazilian economy in the coming weeks following this initiative.

We are closely evaluating the impact of COVID-19 on our business. The situation is evolving and could have a material impact on us if there is significant supply chain disruption or customer demand declines.

Acquisitions

- *Minerações Brasileiras Reunidas S.A. (MBR)*. On December 20, 2019, Vale redeemed and cancelled all preferred shares class A of MBR, which were held by Banco Bradesco BBI S.A., for the total value of R\$3.309 billion. Upon completion of such corporate transaction, Vale consolidated a 98.3% equity position in MBR. MBR is a subsidiary of Vale that owns assets for production, transportation and port shipment of iron ore integrated into our Southern System and accounted for the production of approximately 59 Mt of iron ore in 2018.
- *Ferrous Resources*. In August 2019, we concluded the acquisition of Ferrous Resources Limited, a company that owns and operates iron ore mines near our operations in Minas Gerais, for a cash consideration of US\$525 million. The transaction immediately increased our production of high-quality pellet feed.
- *New Steel*. In January 2019, we concluded the acquisition of New Steel Global NV (New Steel), a company that develops innovative iron ore beneficiation technologies, for US\$496 million. New Steel currently owns patents in 56 countries for Fines Dry Magnetic Separation (FDMS), a dry processing concentration technique.

Full production capacity of 90 Mtpy of S11D enabled

In December 2019, we completed the physical works and the start-up of the CLN S11D project, which enables the full production capacity of 90 million metric tons per year at the S11D mine in 2020. The CLN S11D project increased logistics capacity of the Northern System, through the expansion of approximately 570 km of railway, the construction of a railway spur of 101 km, the acquisition of wagons and locomotives and port expansion (onshore and offshore expansions at Ponta da Madeira maritime terminal). Until 2022, the project will be in a monitored ramp-up phase.

Sale of interest in Longyu

In December 2019 we entered into an agreement to sell our 25% stake in Longyu Energy Resources Co., Ltd. (*Longyu*) to Yongmei Group Co., Ltd (Yongmei), for CNY1.065 billion (equivalent to approximately US\$152 million). Longyu produces metallurgical and thermal coal and other related products in the Henan province in China. Closing of the transaction is expected to occur in 2020, subject to certain conditions precedent.

Obtaining of licenses for resumption of Samarco's operations

In October 2019, Samarco obtained the Corrective Operation License (LOC) relating to its operations in the Germano Complex, located in the Brazilian state of Minas Gerais. With the license, Samarco has now obtained all environmental licenses required to resume its operations. As Samarco is planning on restarting its operations using new technologies for dry tailings stacking, the operations of iron ore extraction and beneficiation plants in Germano and the pelletization plant at the Ubu Complex, located in Anchieta, state of Espírito Santo, will resume only after the implementation of a filtration system, which is expected to take approximately 12 months. During this period, Samarco will continue to prepare to restart its operations, which is currently expected to occur by the end of 2020. Samarco's expected ramp-up has been materially affected by new regulation and changes in existing regulation related to mining activities and dams. Although we expect that Samarco be able to restart operations through one concentrator following the implementation of the filtration technology, increase in production will

depend on the other two concentrators, which activities are expected to resume in six and ten years, respectively.

Resumption of operations in Onça Puma

We resumed our operations at Onça Puma in September 2019, following a decision of the Brazilian Federal Supreme Court (STF). The operations at this mine had been suspended since September 2017 and the nickel processing plant had been halted since June 2019, as a result of court decisions issued in connection with a legal proceeding brought by federal prosecutors against us. See *Additional Information—Legal proceedings—Onça Puma litigation*.

RUPTURE OF SAMARCO'S TAILINGS DAM IN MINAS GERAIS

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

In June 2016, Samarco, Vale and BHPB created the 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 rupture.

The creation of Fundação Renova was provided for under the agreement for settlement and conduct adjustment (the "Framework Agreement") signed in March 2016 by Vale, BHPB, Samarco, the Brazilian federal government, the two Brazilian states affected by the rupture (Minas Gerais and Espírito Santo) and other governmental authorities. The Framework Agreement has a 15-year term, renewable for successive one-year periods until all the obligations under the Framework Agreement have been performed. The Framework Agreement does not provide for admission of civil, criminal or administrative liability for the Fundão dam rupture. The Framework Agreement provides that, within three years of the date of the agreement, the parties would review its terms to assessing the effectiveness of the ongoing remediation and compensation activities.

On June 25, 2018, Samarco, Vale and BHPB entered into a comprehensive agreement with the offices of the federal and state (Minas Gerais and Espírito Santo) prosecutors, public defenders and attorney general, among other parties, improving the governance mechanism of Fundação Renova 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 hired by Samarco to advise the MPF (Federal Prosecutor's Office) over a two-year period (the "June 2018 Agreement"). See *Additional Information—Legal proceedings*. The process of revision of the remediation programs will start in the second half of 2020.

Under the Framework Agreement, the June 2018 Agreement and Renova's by-laws, Fundação Renova must be funded by Samarco, but to the extent that Samarco is unable to fund, Vale and BHPB must ratably bear the funding requirements under the Framework Agreement. As Samarco is currently unable to resume its activities, we and BHPB have been funding the Fundação Renova and also providing funds directly to Samarco, to preserve its operations and to support Samarco's funding obligations.

In October 2019, Samarco obtained the Corrective Operation License (LOC) relating to its operations in the Germano Complex, located in the Brazilian state of Minas Gerais. With the license, Samarco has now

obtained all environmental licenses required to resume its operations. As Samarco is planning on restarting its operations using new technologies for dry tailings stacking, the operations of iron ore extraction and beneficiation plants in Germano and the pelletization plant at the Ubu Complex, located in Anchieta, state of Espírito Santo, will resume only after the implementation of a filtration system, which is expected to take approximately 12 months.

Pursuant to the Framework Agreement, Fundação Renova and Samarco allocated R\$2.6 billion to social and economic remediation and compensation programs in 2019 and have allocated R\$7.8 billion to these programs since the dam rupture. From 2020 to 2021, Samarco, or Vale and BHP, will provide to Fundação Renova funding based on the amounts needed to implement the projects approved for each year, subject to an annual minimum of R\$800 million. Starting in 2022, we expect Samarco to provide the necessary funding in order to complete remaining programs approved for each year.

Additionally, Fundação Renova must allocate a minimum annual amount of R\$240 million over 15 years (from 2016) to the implementation of compensation programs. Under the terms of the Framework Agreement, Fundação Renova must spend an additional amount of at least R\$500 million on sewage collection and treatment and solid waste disposal.

For a discussion of the legal proceedings resulting from the rupture of Samarco's tailings dam, see *Additional Information—Legal proceedings*.

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.

We are members of the International Council on Mining and Metals (ICMM), one of the most important associations in the mining industry, reaffirming our commitment to sustainable development of the mining industry, and we have joined the Task Force on Climate-related Financial Disclosures (TCFD), an association with the purpose of creating a set of recommendations to improve the quality of voluntary disclosure of climate-related information, and the Council of Institutional Investors (CII), an association for effective corporate governance standards and strong shareowner rights.

We have been increasing our engagement with socially responsible investors and key ESG stakeholders through webinars, roadshows and the development of a dedicated website, the ESG Portal. We have also reviewed studies from leading ESG advisors and index providers (such as ISS, Glass Lewis, MSCI, Sustainalytics, Responsible Mining Index, Dow Jones Sustainability Index), and identified approximately 50 gaps with respect to ESG best practices. Based on this assessment, we mapped out an ESG action plan to address these gaps.

After the rupture of Dam I, 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").

In 2019, we launched our ESG Portal, providing greater transparency about our initiatives. These include, among other actions: (a) doubling the percentage of women in the workforce by 2030; (b) obtaining ISO 14001 certification for all operations, (c) establishing an audit committee, (d) establishing a human rights due diligence process, (e) structuring social key performance indicators (KPIs) with short, medium and long-term goals, and (f) establishing long-term compensation with correlation to ESG metrics.

Below are the highlights of our main ESG accomplishments in 2019 and ongoing initiatives:

Environmental

(i) Climate Change

We are committed to supporting actions towards a sustainable low carbon economy and we have established targets for scope 1 and 2 emissions in line with the Paris Agreement goal of limiting global warming to below 2°C pre-industrial levels. We are also targeting carbon neutrality with respect to scopes 1 and 2 emissions by 2050, and in that process, we expect to help customers reach their goals in terms of emissions reductions with our high-grade iron-ore pellets and products.

(ii) Energy

The electricity consumed in our operations comes mostly from clean sources—around 80% of our worldwide electricity consumption comes from renewable sources, but only part of this energy is self-produced (close to 60%). Our target is to achieve energy self-sufficiency from clean sources in Brazil by 2025, and globally by 2030.

(iii) Water

We are committed to reducing fresh water use in our activities by investing in new technologies, in the expansion of our monitoring network and in other initiatives to control total water collection, especially by promoting water reuse. We are currently developing programs and implementing actions that go beyond compliance with the legal requirements to optimize water use and consumption. Our water reuse represents 83% of total production demand. We want to reduce by 10% the new water captured and used in processes per ton produced, which means a smaller volume of fresh water captured for the same volume of production.

(iv) Forest conservation

Our ambition is to act as a global catalyst for forest conservation and reforestation. Currently, we help to protect 1,018,405 hectares of forest as a result of compensation measures, voluntary initiatives and partnerships. We are committed to protecting and reforesting additional 500,000 hectares by 2030, bolstering our 2018 target.

Social

(i) Human Rights

We are committed to the Guiding Principles on Business and Human Rights of the United Nations Human Rights Council. In 2019, we made a Human Rights risk self-assessment in 51 ventures, including operations. An external due diligence assessment is planned for 2020 and subsequent years, in addition to our self-assessment of Human Rights risks. Also in 2019, we held a public consultation on our website to revise our Human Rights Policy.

(ii) Gender Balance

We have announced the goal to double our female workforce by 2030, from 13% to 26% and to double the female presence in leadership roles from 12% to 20%. We have also disclosed the median salary by gender and seniority level.

(iii) Health and Safety

We are committed to improving the health and safety of our workers. Our long-term goals are: (i) reduction to zero recordable injuries with potential for fatality or changed lives, (ii) 50% reduction in the exposure of employees to the top 10 health risks by 2025 and (iii) elimination of the most significant risk scenarios by 2025.

(iv) Socioeconomic Contribution

We are committed to positively impacting society, by investing in socioeconomic actions and projects focused on community development. In particular, we are investing in actions that contribute to the development and improvement of urban infrastructure and mobility, traditional communities, education, culture, health, and work generation and income in the places where we operate. We spent over US\$ 112 million on social initiatives in 2019, of which 62% was on voluntary programs.

(v) Indigenous People and Traditional Communities

Our guidelines with respect to indigenous people and traditional communities are built upon the ICMM's position statement on Mining and Indigenous People, the International Labour Organization (ILO) Indigenous and Tribal Peoples Convention (C169), and the United Nations Declaration on the Rights of Indigenous Peoples. We are committed to respecting the principle of Free, Prior and Informed Consent (FPIC), which entails a process of informing, negotiating in good faith and allowing the Indigenous or traditional communities to freely make decisions.

Governance

(i) Board of Directors

In the 2019 election of members of the Board of Directors, our shareholders elected a third independent member. In addition, our Board of Directors created three Independent Ad Hoc Consulting Committees to conduct an independent investigation into the causes of the rupture of Dam I, monitor our measures to support the affected communities and remediate the affected areas, and to monitor our safety initiatives, risk management and risk mitigation efforts related to dams and recommend measures. In 2019, we also engaged external advisors to conduct an investigation into the causes of the dam rupture.

In March 2020, we adopted additional measures to enhance our governance structure, establishing our Audit Committee and assigning to our Personnel and Governance Committee the role of Nomination Committee until 2021, when a specific Committee will be set up for this purpose.

(ii) Compensation

We are committed to aligning our compensation programs to our business strategy and the goal of making Vale a safer company. We implemented a number of changes, such as the adoption of a *malus* clause under which the Board of Directors may reduce variable compensation of executives upon the

occurrence of events of exceptional severity, and the implementation of new share ownership guidelines for Executive Officers.

In 2019, 60% of Executive Directors performance goals were based on Health and Safety, Sustainability metrics and actions to repair the damage caused by the Dam I rupture. For 2020, we approved new standards: for short-term compensation, at least 30% of performance goals will be ESG-driven and directly related to safety, risk management and sustainability targets, and with respect to long-term compensation, at least 20% of performance goals will be based on ESG metrics. Overall, 12% of total remuneration will be linked to ESG metrics.

(iii) Risk Management

In 2019, we enhanced our defense line model, creating a new Safety and Operational Excellence Office, with compensation structures that are not correlated to the results of our operations. We established four executive committees created to advise our management with respect to each of these risks: (i) operational risks, (ii) geotechnical risks, (iii) strategy, finance and cyber risks, and (iv) compliance risks. In February 2019, we also launched two Geotechnical Monitoring Centers (CMG), one located in Nova Lima, and the other in Itabira, both in the state of Minas Gerais, which operate 24-hours a day, covering our critical geotechnical structures in Brazil. To oversee the third line of defense, our Board of Directors decided to establish a Compliance Office headed by a Chief Compliance Officer, who will report directly to our Board of Directors and interact with the Audit Committee. The Chief Compliance Officer will be responsible for the integrity department, the internal audit and the Whistleblower Channel. The proposal to amend our bylaws in order to implement this decision will be submitted to our shareholders in our next shareholders' meeting.

(iv) Integrity

We have a Code of Conduct that applies to our employees and to the members of our Board of Directors and our Board of Executive Officers. 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. In 2019, our Whistleblower Channel received 3,507 complaints and closed 3,382 cases, of which (i) 2,937 lead to investigations, that confirmed violations of our Code of Conduct in 38% of these cases, (ii) 291 referred to complaints that were not investigated due to lack of information or pertinence to the scope of the Ethics and Conduct Office, (iii) 154 were consultations, which were answered by the Ethics and Conduct Office, but did not lead to an investigation. All confirmed violations triggered correction plans. These investigations resulted in 1,833 corrective actions, including the termination of 227 employees. See *Additional Information—Code of conduct*.

SELECTED FINANCIAL DATA

The tables below present selected consolidated financial information as of and for the years indicated. You should read this information together with our consolidated financial statements in this annual report.

Consolidated statement of income data

	For the year ended December 31,				
	2019	2018	2017	2016	2015
	(US\$ million)				
Net operating revenues	37,570	36,575	33,967	27,488	23,384
Cost of goods sold and services rendered	(21,187)	(22,109)	(21,039)	(17,650)	(18,751)
Selling, general, administrative and other operating expenses, net	(992)	(968)	(951)	(774)	(819)
Research and evaluation expenses	(443)	(373)	(340)	(319)	(395)
Pre-operating and operational stoppage	(1,153)	(271)	(413)	(453)	(942)
Brumadinho event	(7,402)	-	-	-	-
Impairment and disposal of non-current assets	(5,074)	(899)	(294)	(1,240)	(8,708)
Operating income (loss)	1,319	11,955	10,930	7,052	(6,231)
Non-operating income (expenses):					
Financial income (expenses), net	(3,413)	(4,957)	(3,019)	1,843	(10,654)
Equity results and other results in associates and joint ventures	(681)	(182)	(82)	(911)	(794)
Income (loss) before income taxes	(2,775)	6,816	7,829	7,984	(17,679)
Current and deferred taxes	595	172	(1,495)	(2,781)	5,249
Net income (loss) from continuing operations	(2,180)	6,988	6,334	5,203	(12,430)
Net income (loss) attributable to non-controlling interests	(497)	36	21	(8)	(501)
Net income (loss) from continuing operations attributable to Vale's stockholders	(1,683)	6,952	6,313	5,211	(11,929)
Net income (loss) from discontinued operations attributable to Vale's stockholders	-	(92)	(806)	(1,229)	(200)
Net income (loss) attributable to Vale's stockholders	(1,683)	6,860	5,507	3,982	(12,129)
Net income (loss) attributable to non-controlling interests	(497)	36	14	(6)	(491)
Net income (loss)	(2,180)	6,896	5,521	3,976	(12,620)
Total cash paid to stockholders(1)	-	3,313	1,456	250	1,500

(1) Consists of total cash paid to stockholders during the year, whether classified as dividends or interest on stockholders' equity.

Earnings (loss) per share

The table below shows our earnings (loss) per share. The earnings (loss) per share for 2015 to 2016 have been retrospectively adjusted to reflect the conversion of our Class A preferred shares into common shares, which was concluded in November 2017, as if the conversion had occurred at the beginning of the earliest year presented.

	For the year ended December 31,				
	2019	2018	2017	2016	2015
	(US\$, except as noted)				
Earnings (loss) per common share from continuing operations ..	(0.33)	1.34	1.21	1.00	(2.30)
Earnings (loss) per common share from discontinued operations ..	-	(0.02)	(0.16)	(0.23)	(0.03)
Earnings (loss) per common share	(0.33)	1.32	1.05	0.77	(2.33)
Weighted average number of shares outstanding (in thousands)(1)(2)	5,127,950	5,178,024(3)	5,197,432	5,197,432	5,197,432
Distributions to stockholders per share(2)(4)					
Expressed in US\$	-	0.64	0.28	0.05	0.29
Expressed in R\$	-	2.39	0.90	0.17	0.98

(1) Each common ADS represents one common share.

(2) Restated as if the conversion had occurred at the beginning of the earliest year presented.

- (3) The number of weighted average shares outstanding as of December 31, 2018 has been revised, with no impact on the basic and diluted earnings (loss) per share from continuing operations as of December 31, 2018.
- (4) Our distributions to shareholders may be classified as either dividends or interest on shareholders' equity. In many years, part of each distribution has been classified as interest on shareholders' equity and part has been classified as dividends. For information about distributions paid to shareholders, see *Share Ownership and Trading—Distributions*.

Balance sheet data

	As of December 31,				
	2019	2018	2017	2016	2015
	(US\$ million)				
Current assets	17,042	15,292	15,367	13,978	11,429
Non-current assets held for sale	–	–	3,587	8,589	4,044
Property, plant and equipment, net and intangible assets	55,075	56,347	63,371	62,290	59,426
Investments in associated companies and joint ventures	2,798	3,225	3,568	3,696	2,940
Non-current assets	16,798	13,326	13,291	10,461	10,653
Total assets	91,713	88,190	99,184	99,014	88,492
Current liabilities	13,845	9,111	11,935	10,142	10,438
Liabilities associated with non-current assets held for sale	–	–	1,179	1,090	107
Long-term liabilities(1)	27,033	19,784	20,512	19,096	15,896
Long-term debt(2)	11,842	14,463	20,786	27,662	26,347
Total liabilities	52,720	43,358	54,412	57,990	52,788
Stockholders' equity:					
Capital stock	61,614	61,614	61,614	61,614	61,614
Additional paid-in capital	(2,110)	(1,122)	(1,106)	(851)	(854)
Retained earnings and revenue reserves	(19,437)	(16,507)	(17,050)	(21,721)	(27,171)
Total Vale shareholders' equity	40,067	43,985	43,458	39,042	33,589
Non-controlling interests	(1,074)	847	1,314	1,982	2,115
Total stockholders' equity	38,993	44,832	44,772	41,024	35,704
Total liabilities and stockholders' equity	91,713	88,190	99,184	99,014	88,492

(1) Excludes long-term debt.

(2) Excludes current portion of long-term debt.

FORWARD-LOOKING STATEMENTS

This annual report contains statements that may constitute forward-looking statements within the meaning of the safe harbor provisions of the U.S. Private Securities Litigation Reform Act of 1995. Many of those forward-looking statements can be identified by the use of forward-looking words such as “anticipate,” “believe,” “could,” “expect,” “should,” “plan,” “intend,” “estimate” and “potential,” among others. Those statements appear in a number of places and include statements regarding our intent, belief or current expectations with respect to:

- the impact of the tailings dam rupture at the Córrego do Feijão mine and related remediation measures on our operations, cash flows and financial position;
- the outcome of the various investigations, regulatory, governmental and legal proceedings in which we are involved;
- our direction and future operation;
- the implementation of our financing strategy and capital expenditure plans;
- the exploration of mineral reserves and development of mining facilities;
- the depletion and exhaustion of mines and mineral reserves;
- trends in commodity prices, supply and demand for commodities;
- the future impact of competition and regulation;
- 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;
- the duration and severity of the recent coronavirus (COVID-19) outbreak and its impacts on our business;
- 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, including factors relating to the coronavirus pandemic outbreak, (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

Developments relating to the outbreak of the coronavirus may have a material adverse impact on our financial conditions or results of operations.

In December 2019, an outbreak of a contagious disease, the Coronavirus Disease 2019 (COVID-19), began in mainland China and has since spread through various countries. There have been reports of multiple fatalities from the virus in various countries, including Brazil and Canada, where we have our main operations. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 outbreak pandemic. During the month of March 2020, governmental authorities in various jurisdictions imposed lockdowns or other restrictions to contain the virus, and various businesses suspended or reduced operations. The final impact on the global economy and financial markets is still uncertain, but is expected to be significant.

The outbreak has begun to advance over the regions where our operations are concentrated. We have ramped down some operations and revisited plans for others. See *Overview—Business overview—Significant changes in our business*. We may face restrictions imposed by regulators and authorities, difficulties related to employee absences resulting in insufficient personnel at some sites, disruption of our supply chain, deterioration of our customers' financial health, higher costs and expenses associated with the suspension of contractors' work on non-essential projects, operational difficulties such as the postponement of the resumption of our production capacity due to delayed inspections, assessments or authorizations, among other operational difficulties. We may need to adopt further contingency measures or eventually suspend additional operations, which may have a material adverse impact on our financial conditions or results of operations.

As a result of this coronavirus pandemic outbreak, business activities all over the world, including construction and manufacturing activities that drive demand for iron ore and other metals, have started to decline and are expected to be significantly impacted. If the coronavirus outbreak continues and efforts to contain the pandemic, whether governmental or otherwise, further limit business activity, or limit our ability to transport our products to customers generally, for an extended period of time, the demand for our products could be adversely impacted. These factors could also have a material adverse impact on our financial conditions or results of operations.

RISKS RELATING TO DAM RUPTURE

The rupture of Dam I in Minas Gerais has adversely affected our business, financial condition and reputation, and the overall impact of the dam rupture on us is still uncertain.

On January 25, 2019, Dam I failed, resulting in 270 fatalities or presumed fatalities, in addition to personal, property and environmental damages. See *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine*. This event has adversely affected and will continue to adversely affect our operations.

- *Liabilities and legal proceedings.* We are a defendant in a number of other legal proceedings in which plaintiffs claim significant amounts in damages and other measures against us resulting from the event, and additional proceedings and investigations may be initiated in the future. These liabilities or actions taken by creditors may have a material adverse effect on our business and financial condition. See *Overview—Business overview—Impacts of the rupture of Dam I on Vale—Liabilities and legal proceedings* and *Additional Information—Legal proceedings*.
- *Liquidity.* Some of our assets remain restricted as a result of court order, and additional assets may be attached in the future. See *Operating and Financial Review and Prospects—*

Overview—Rupture of Dam I. These attachments and asset freezes may adversely impact our business and liquidity.

- *Suspension of operations.* Following the dam rupture, we have suspended various operations, which have adversely impacted and may continue to adversely impact our production and cash flows. See *Overview—Business overview—Impacts of the rupture of Dam I on Vale—Suspension of operations.* As a result of the suspended operations, we may need to purchase iron ore and iron ore pellets in the market to honor our obligations under existing commercial contracts, which may increase our overall costs and adversely impact our business and financial condition. It is possible that certain of these operations may not be resumed.
- *Increase in production costs and capital investments.* We may need to make investments or adjustments in the operations not impacted by the dam rupture to increase production, 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 of our 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.
- *Increased taxation and other obligations.* We may be subject to new or increased taxes or other obligations to fund remediation measures and compensate direct and indirect impacts of the rupture of Dam I. Also, we have entered into settlement agreements with the state of Minas Gerais and certain municipalities to minimize the socio-economic effects of the shutdown of some of our operations.
- *Additional regulation and restrictions on mining operations.* Various governmental authorities have proposed and approved new rules relating to licensing, use and operations of dams in response to the Dam I rupture. See *Overview—Business overview—Impacts of the rupture of Dam I on Vale—New regulations.* New rules imposing restrictions on mining operations and ancillary activities may be approved. The licensing process for our operations may become longer and subject to more uncertainties. These additional laws and regulations may impose restrictions on our operations, require additional investments or even require us to suspend additional operations, which may adversely affect our business.
- *Reserves.* Developments resulting from the rupture of Dam I, particularly new regulations applicable to dam licensing and use and the ongoing proceedings and investigations, may result in decreases in our reported reserves or reclassification of proven reserves as probable reserves. We continuously review the impact of new regulations, proceedings and investigations on our reported reserves. See *Overview—Business overview—Impacts of the rupture of Dam I on Vale—Impact on reserves.*
- *Inability to comply with additional safety requirements or to obtain required certifications.* Rules on dam safety are getting stricter following the dam rupture. Also, external experts may be reluctant to attest to the stability and safety of our dams, as a result of the uncertainties regarding the causes of the Dam I rupture and the increasing risks of liability. See *Overview—Business overview—Impacts of the rupture of Dam I on Vale—Uncertainties arising from increased safety requirements and external expert certification.* 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 cause further damage to our reputation.

- *Inability to pay dividends.* Reduced cash flows and increased liabilities may adversely affect our ability to pay dividends or make other distributions to our shareholders. Immediately after the dam rupture, our Board of Directors determined the suspension of our shareholder remuneration policy.
- *Increased funding requirements.* We may need to raise funds in the financial markets to meet our existing commitments and the potential liabilities and capital expenditures associated with the remediation of environmental damages. We may not be able to obtain funds at acceptable costs.
- *Increased cost of insurance.* Our cost of insurance is expected to rise, and we may not be able to obtain insurance for certain risks.
- *Management attention.* Since the date of the dam rupture, attention of our senior management and our Board of Directors is focused on the emergency actions and other measures in response to the crisis and diverted from our core business.
- *Impact on our financial performance.* We expect the rupture of Dam I to continue to have a significant impact on our financial performance, which include reduced revenues due to the suspension of operations, increased expenditures for assistance and remediation, impairments of fixed assets, provisions for costs of decharacterization, restoration and recovery, and provisions for legal proceedings. See *Operating and Financial Review and Prospects—Overview—Rupture of Dam I*.
- *Additional environmental impacts.* Additional environmental consequences of the rupture of the dam remain uncertain. The impact of the rupture of Dam I on the water quality of the Paraopeba River affected its use up to the city of Pompéu, including public supply in the cities of Pará de Minas and Paraopeba. Heavy rains in the Paraopeba River basin during January 2020 intensified the impacts on the water quality of the Paraopeba River and there is no guarantee that interstate rivers will not be impacted as well, which could lead to additional proceedings and investigations by the federal authorities. Failure to implement our decharacterization 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.

The rupture of a dam or similar structure may cause severe damages, and the decharacterization of our upstream dams may be long and costly.

We own a number of dams and similar structures. In addition, we own stakes in companies that own a number of dams or similar structures, including Samarco and Mineração Rio do Norte S.A. (MRN). The rupture of any of these structures could cause loss of life and severe personal, property and environmental damages, and could have adverse effects on our business and reputation, as evidenced by the consequences of the rupture of Dam I at Córrego do Feijão. See *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine*. Some of our dams, and some of the dams owned by our investees, such as Samarco and MRN, were built using the “upstream” raising method, which presents specific stability risks.

Recently approved laws and regulations require us to decharacterize all of our upstream dams on a specified timetable. We are still determining the appropriate measures for the decharacterization of each

upstream dam. This process will require significant expenditures, and the decharacterization process may take a long time. According to our decharacterization plan, we estimate the costs for conclusion of the decharacterization process to be US\$2.6 billion, and although we expect to conclude the decharacterization process for all of our upstream dams within five years, we may not be able to do so within such time-frame.

Our obligations and potential liabilities arising from the rupture of a tailings dam owned by Samarco in Minas Gerais could negatively impact our business, our financial conditions and our reputation.

In November 2015, the Fundão tailings dam owned by Samarco failed, causing fatalities and environmental damage in the surrounding area. The rupture of Samarco's tailings dam has adversely affected and will continue to affect our business, and the full impact is still uncertain and cannot be estimated. Below is a discussion of the main effects of the dam rupture on our business.

- *Legal proceedings.* We are involved in multiple legal proceedings and investigations relating to the rupture of the Fundão tailings dam, and other proceedings and investigations may arise in the future. These proceedings include putative securities class actions in the United States against us and some of our current and former officers, a criminal proceeding in Brazil, public civil actions brought by Brazilian authorities and multiple proceedings involving claims for significant amounts of damages and remediation measures. Adverse results in these proceedings may impact our liquidity and our financial condition. Tax authorities or other creditors of Samarco may attempt to recover from us amounts due by Samarco. See *Additional Information—Legal proceedings.*
- *Reparation obligations and other undertakings.* As Samarco is currently unable to resume its activities, we and BHPB have been funding Fundação Renova to support certain remediation measures undertaken by Samarco and also providing funds directly to Samarco, to preserve its operations. If Samarco is unable to resume operations or to generate sufficient cash flows to fund the remediation measures required under these agreements, we will be required to continue funding these remediation measures, which in turn may adversely affect our liquidity and financial conditions. See *Overview—Business overview—Rupture of Samarco's tailings dam in Minas Gerais.*
- *Risk of additional environmental damages.* 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. Failure to contain the remaining tailings could also impact the feasibility and timing for the restart of Samarco's operations.
- *Other impacts.* We may encounter delays in the receipt of environmental and other licenses for our tailings dams and other facilities, and Brazilian authorities may impose more stringent conditions in connection with the licensing process of our projects and operations. Also, as one of Samarco's shareholders, our reputation has been adversely affected by the rupture of Samarco's tailings dam.

EXTERNAL RISKS

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

As a mining company, we are a supplier of industrial raw materials. Industrial production tends to be the most cyclical and volatile component of global economic activity, 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, 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.

Also, 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. Moreover, 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 joint ventures or unrelated 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.

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, impairment of assets, and may adversely affect our cash flows, financial position and results of operations. We expect that the price of our products will be subject to additional volatility in 2020 due to the impact of the COVID-19 pandemic.

Demand for our iron ore, coal and nickel products depends on global demand for steel. Iron ore and iron ore pellets, which together accounted for 78% of our 2019 net operating revenues, are used to produce carbon steel. Nickel, which accounted for 7.7% of our 2019 net operating revenues, is used mainly to produce stainless and alloy steels. The prices of different steels 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.

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, 2019 by approximately US\$290 million. Average iron ore prices significantly

changed in the last five years, from US\$55.5 per dmt in 2015, US\$58.5 per dmt in 2016, US\$71.3 per dmt in 2017, US\$69.5 per dmt in 2018 and US\$93.4 per dmt in 2019, according to the average Platts IODEX (62% Fe CFR China). On March 18, 2020, the year-to-date average Platts IODEX iron ore price was US\$90.75 per dmt. See *Operating and Financial Review and Prospects—Overview—Major factors affecting prices*.

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 2019, Chinese demand represented 73% of global demand for seaborne iron ore, 56% of global demand for nickel and 51% of global demand for copper. The percentage of our net operating revenues attributable to sales to customers in China was 48.6% in 2019. Therefore, any contraction of China's economic growth could result in lower demand for our products, leading to lower revenues, cash flow and profitability. Poor performance in the Chinese real estate sector, the largest consumer of carbon steel in China, would also negatively impact our results. These risks may be intensified in 2020 due to the impact of the COVID-19 pandemic.

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 our debt is 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 2019, we had net foreign exchange gains of US\$39 million, while we had net foreign exchange losses of US\$2.247 million in 2018 and net foreign exchange losses of US\$467 million in 2017. In addition, changing values of the Brazilian *real*, the Canadian dollar, the Euro, the Indonesian rupiah, the Chinese *yuan* and other currencies against the U.S. dollar affects our results since most of our costs of goods sold is denominated in currencies other than the U.S. dollar, principally the *real* (44% in 2019) and the Canadian dollar (6% in 2019), 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.

Significant volatility in currency prices 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.

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 rupture of Dam I, 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*.

LEGAL, POLITICAL, ECONOMIC, SOCIAL AND REGULATORY RISKS

Legal proceedings and investigations could have a material adverse effect on our business in the event of unfavorable outcomes

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. Also, 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 and employees 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.

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*.

Political, economic and social conditions in the countries in which we have operations or projects 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, 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.

Political, social and economic instability in Brazil could adversely impact our business and the market price of our securities.

The Brazilian 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 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.

In the last years, Brazil faced an economic recession, adverse fiscal developments and political instability. Brazilian GDP grew by 1.1% in 2019, 1.3% in 2018 and 1.3% in 2017. Unemployment rate was 11.9% in 2019, 12.3% in 2018 and 12.7% in 2017. Inflation, as reported by the consumer price index (IPCA), was 4.31% in 2019, 3.75% in 2018 and 2.95% in 2017. The Brazilian Central Bank's base interest rate (SELIC) was 4.5% on December 31, 2019, 6.50% on December 31, 2018 and 7.00% on December 31, 2017. 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.

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

Disputes with communities where we operate may arise from time to time. Accidents or incidents involving mines, industrial facilities and related infrastructure, such as the rupture of Dam I, may significantly impact the communities where we operate. In some instances, our operations and mineral reserves are located on or near lands owned or used by indigenous peoples 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, 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 otherwise hamper our ability to develop our reserves and conduct our operations. See *Information on the Company—Regulatory matters* and *Additional Information—Legal proceedings*.

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, 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, 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 and concessions from governmental regulatory agencies 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 of time. 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. For more information on mining concessions and other similar rights, see *Information on the Company—Regulatory matters*.

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 capacity 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 accidents or 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 damages 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, HIV/AIDS, 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.

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 (TCLD) used to transport our iron ore production from the S11D mine to the beneficiation plant, could adversely impact our operations at the S11D mine.

Our business could be adversely affected by the failure of our counterparties, joint venture partners or joint ventures we do not control to perform their obligations.

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

Important parts of our iron ore, pelletizing, nickel, coal, 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 partners or joint ventures to adopt adequate standards, controls and procedures could lead to higher costs, reduced production or environmental, health and safety incidents or accidents, which could adversely affect our results and reputation.

We may not have adequate insurance coverage for some business 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 that may provide us with goods or services.

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 10.6% of our total cost of goods sold in 2019. To fulfill our energy needs, we rely on the following sources: oil byproducts, which represented 31% of total energy needs in 2019, electricity (29%), natural gas (15%), coal (16%) and other energy sources (5%).

Electricity costs represented 4.0% of our total cost of goods sold in 2019. 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, especially Brazil, due to lack of infrastructure 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.

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

We rely heavily on information technology, operational technology and telecommunications systems for the operation of many of our business processes. Failures in those systems, whether caused by obsolescence, technical failures, negligence, accident or malicious acts, may result in the disclosure or theft of sensitive information, misappropriation of funds and disruptions to or interruption in our business operations. We may be 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 information technology, operational technology, cybersecurity or telecommunications systems, or breaches of information security, may harm our reputation and have a material adverse effect on our operational performance, earnings and financial condition.

HEALTH, SAFETY, ENVIRONMENTAL AND SOCIAL RISKS

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

Our operations involve the use, handling, storage, discharge and disposal of hazardous substances into the environment and the use of natural resources, resulting in significant risks and hazards, including fire, explosion, toxic gas leaks, spilling 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 and accidents. 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, 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. Notwithstanding our standards, policies, controls and monitoring procedures, our operations remain subject to incidents or accidents that could adversely impact our business, stakeholders or reputation.

In February 2020, a vessel owned and operated by the South Korean company Polaris Shipping suffered damage and run aground after leaving the Ponta da Madeira Maritime Terminal, in the state of Maranhão, loaded with approximately 295 Mt of iron ore produced by us. We are supporting the ship owner with technical-operational and preventive measures to safely remove the fuel and iron ore cargo from this vessel. We successfully concluded de-bunkering operations (removal of bunker oil from the vessel) on March 27, 2020, and the salvage work is ongoing. A minor quantity of bunker oil still remains on board to keep the generators working and support the salvage operation. The authorities are investigating the causes of the incident. A leakage of fuel from this vessel into the sea may cause significant environmental damages, which could adversely impact our business, stakeholders or reputation.

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 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. 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, decharacterization, decommissioning, distribution and marketing of our products. Such regulation may give rise to significant costs and liabilities. Litigation 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.

In response to the rupture of Dam I, additional environmental and health and safety laws and regulations have been approved, and other may be forthcoming, and authorities may impose more stringent conditions in connection with the licensing process of our projects and operations. We will encounter more stringent requirements for and delays in the receipt of environmental operating license for other dams.

National policies and international regulations regarding climate change may affect a number of our businesses in various countries. The ratification of the Paris Agreement in 2016 increased international pressure for the establishment of a global carbon price, and on companies to adopt carbon pricing strategies. The pricing of greenhouse gas emissions may impact our operational costs, mainly through higher price for fossil fuels as mining is an energy intensive industry, and our cost of international freight. In particular, consumption of thermal coal, one of the products we sell, is facing pressure from international institutions due to its carbon intensity.

Regulatory initiatives at the national and international levels, as evidenced by the 2020 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, could affect our shipping practices, potentially increasing our costs or requiring us to make new capital expenditures. Other regulations, mainly from the European Union and China, may impose additional requirements for our products related to the safety of downstream users.

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 wind storms, droughts, floods, earthquakes and tsunamis may adversely affect our operations and projects 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 remains uncertain, but we are likely to experience changes in rainfall patterns, increased temperatures, water shortages, rising sea levels, increased storm frequency and intensity as a result of climate change, which may adversely affect our operations. 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.

RISKS RELATING TO OUR MINING RESERVES

Our reserve estimates may materially differ from mineral quantities that we are actually able to recover; our estimates of mine life may prove inaccurate; more stringent regulations and market price fluctuations and changes in operating and capital costs may render certain ore reserves uneconomical to mine.

Our reported reserves are estimated quantities of ore and minerals that we have determined can be economically and legally mined and processed under present and assumed future conditions. There are numerous uncertainties inherent in estimating quantities of reserves and in projecting potential future rates of mineral production, including factors beyond our control. Reserve reporting involves estimating deposits of minerals that cannot be measured in an exact manner, and the accuracy of any reserve estimate is a function of the quality of available data, engineering, costs, investments, geotechnics,

geological interpretation and judgment. As a result, 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. Reserve estimates and estimates of mine life may require revisions based on actual production experience, projects, updated exploration drilling data and other modifying factors. Lower market prices of minerals and metals, more stringent regulations, reduced recovery rates or increased operating and capital costs due to inflation, exchange rates, changes in regulatory requirements (See *Information on the Company—Regulatory matters*) or other factors may render proven and probable reserves uneconomic to exploit and may ultimately result in a reduction of reserves. Also, our inability to obtain licenses for new operations, supporting structures or activities, or to renew our existing licenses, can cause a reduction of our reserves. Such a reduction could affect depreciation and amortization rates and have an adverse effect on our financial performance. Starting in the fiscal year ending on December 31, 2021, we will be required to comply with the new SEC reporting rules on mining activities. We are currently reviewing our reported mining reserves, and we may need to adjust our reported reserves to be able to report in compliance with the new rules.

We may not be able to replenish our reserves, which could adversely affect our mining prospects.

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 expansion or replacement of reserves depleted by current production. If we do not develop new reserves, we will not be able to sustain our current level of production beyond the remaining lives of our existing mines.

The feasibility of new mineral projects may change over time.

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. Substantial time and expenditures are required to:

- establish mineral reserves through drilling;
- determine appropriate mining and metallurgical processes for optimizing the recovery of metal contained in ore;
- obtain environmental and other licenses;
- construct mining, processing facilities and infrastructure required for brownfield and greenfield properties; and
- obtain the ore or extract the minerals from the ore.

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. 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.

We face rising extraction costs and investment requirements over time as reserves deplete.

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 reserves, 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.

RISKS RELATING TO OUR CORPORATE STRUCTURE

The shareholders that are party to our shareholders' agreement have significant power over Vale.

Pursuant to a shareholder's agreement, our major shareholders Litel Participações S.A. ("Litel"), Litela Participações S.A. ("Litela"), Bradespar S.A. ("Bradespar"), Mitsui & Co., Ltd. ("Mitsui") and BNDES Participações S.A. ("BNDESPAR") undertook to vote jointly on certain key matters. This shareholders' agreement is expected to expire on November 9, 2020. On December 31, 2019, Litela, Litel, Bradespar, Mitsui and BNDESPAR together held 35.66% of our total capital stock. See *Share Ownership and Trading—Major shareholders*. As long as no other shareholder or group of shareholders owns more shares than the parties to the Shareholders' Agreement, these major shareholders may elect a majority of the members of our Board of Directors and control the outcome of certain actions requiring shareholder approval.

The Brazilian Government has certain veto rights.

The Brazilian government owns 12 golden shares of Vale, 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—Memorandum and articles of association—Common shares and golden shares*.

Our governance and compliance processes may fail to prevent breaches of legal, accounting 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. 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, accounting or governance standards. We may be subject to breaches of our code of conduct, anti-corruption policies and business conduct protocols and to instances of fraudulent behavior, corrupt practices and dishonesty by our employees, contractors or other agents. 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.

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 (STJ—*Superior Tribunal de Justiça*), 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.

RISKS RELATING TO OUR DEPOSITARY SHARES

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 could be imposed in the future.

ADR holders may not have all the rights of our shareholders, and may be unable to exercise 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. Also, 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.

ADR holders may encounter difficulties in the exercise of voting rights.

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 depositary. In practice, the ability of a holder of ADRs to instruct the depositary as to voting will depend on the timing and procedures for providing instructions to the depositary either directly or through the holder's custodian and clearing system. With respect to ADSs for which instructions are not received, the depositary may, subject to certain limitations, grant a proxy to a person designated by us.

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. Ferrous minerals

- 1.1 Iron ore and iron ore pellets
 - 1.1.1 Iron ore operations
 - 1.1.2 Iron ore production
 - 1.1.3 Iron ore pellets operations
 - 1.1.4 Iron ore pellets production
 - 1.1.5 Customers, sales and marketing
 - 1.1.6 Competition
- 1.2 Manganese ore and ferroalloys
 - 1.2.1 Manganese ore operations and production
 - 1.2.2 Ferroalloys operations and production
 - 1.2.3 Manganese ore and ferroalloys: sales and competition

2. Base metals

- 2.1 Nickel
 - 2.1.1 Operations
 - 2.1.2 Production
 - 2.1.3 Customers and sales
 - 2.1.4 Competition
- 2.2 Copper
 - 2.2.1 Operations
 - 2.2.2 Production
 - 2.2.3 Customers and sales
 - 2.2.4 Competition
- 2.3 PGMs and other precious metals
- 2.4 Cobalt

3. Coal

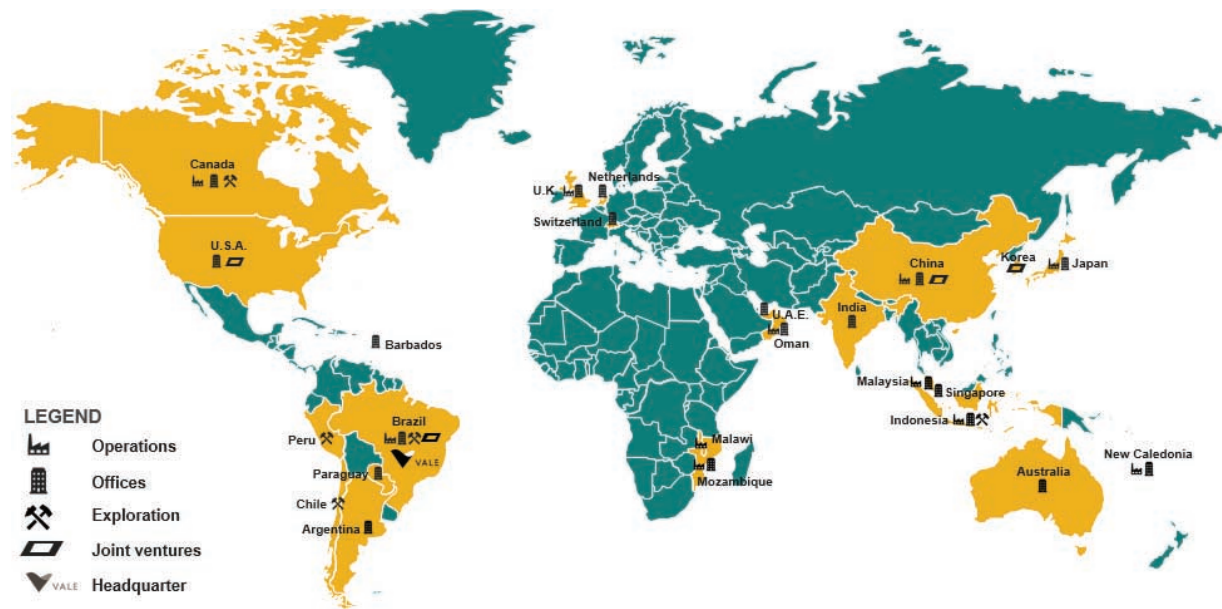
- 3.1 Operations
- 3.2 Production
- 3.3 Customers and sales
- 3.4 Competition

4. Infrastructure

- 4.1 Logistics
 - 4.1.1 Railroads
 - 4.1.2 Ports and maritime terminals
 - 4.1.3 Shipping
- 4.2 Energy

5. Other investments

Lines of Business



1. FERROUS MINERALS

Our ferrous minerals business includes iron ore mining, iron ore pellet production, manganese ore mining and ferroalloy production. Each of these activities is described below.

1.1 Iron ore and iron ore pellets

1.1.1 Iron ore operations

We conduct our iron ore business in Brazil primarily at the parent-company level, and through our subsidiaries Mineração Corumbaense Reunida S.A. (“MCR”) and Minerações Brasileiras Reunidas S.A. (“MBR”). 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. We also conduct mining operations in the Midwestern System. We conduct each of our iron ore operations in Brazil under concessions from the federal government granted for an indefinite period, subject to the life of mines.

Company/Mining System	Location	Description/History	Mineralization	Operations	Power source	Access/Transportation
Vale Northern System.....	Carajás, state of Pará	Divided into Serra Norte, Serra Sul and Serra Leste (Northern, Southern and Eastern ranges). Since 1984, we have been conducting mining activities in the northern range, which is divided into three main mining areas (N4W, N4E and N5) and two major beneficiation plants. In 2014, we started a mine and beneficiation plant in Serra Leste. Our operations in Serra Sul, where our S11D mine is located, started in 2016.	High-grade hematite ore type (iron grade around 65%).	Open-pit mining operations. In Serra Norte, one of the major plants applies the natural moisture beneficiation process, consisting of crushing and screening, and the other applies both the natural moisture and the wet beneficiation process in distinct lines. The 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 produces only sinter feed and Serra Leste produces lump and sinter feed.	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	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 the new 101-kilometers long railroad spur to the EFC railroad.
Southeastern System....	Iron Quadrangle, state of Minas Gerais	Three mining complexes: Itabira (two mines, with three major beneficiation plants), Minas Centrais (two mines, with two major beneficiation plants and one secondary plant) and Mariana (three mines, with three major beneficiation plants).	Ore reserves 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.	Open-pit mining operations. 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. For status of halted operations see <i>Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine</i> .	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	EFVM railroad connects these mines to the Tubarão port.
Southern System.....	Iron Quadrangle, state of Minas Gerais	Two major mining complexes: Vargem Grande (four mines and four major beneficiation plants) and Paraopeba (four mines and three major beneficiation plants). In 2019, we reorganized our Southern System to eliminate the Minas Itabirito complex, and to consider the mines that composed this complex as part of the Vargem Grande and Paraopeba complexes.	Ore reserves with high ratios of itabirite ore type relative to hematite ore type. Itabirite ore 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.	Open-pit mining operations. 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. For status of halted operations see <i>Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine</i> .	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	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.
Midwestern System.....	State of Mato Grosso do Sul	Two mines and two plants located in the city of Corumbá.	Hematite ore type, which generates lump ore predominantly. Iron grade of 62% on average.	Open-pit mining operations. The beneficiation process for the run-of-mine consists of standard crushing and classification steps, producing lump ore and sinter feed.	Supplied through the national electricity grid. Acquired through power purchase agreements.	Transported by barges traveling along the Paraguay and Paraná rivers to transhippers at the Nueva Palmira port in Uruguay, or delivered to customers at Corumbá.

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 2019(2)
		2019(1)	2018(1)	2017(1)	
		(million metric tons)			(%)
Southeastern System					
Itabira	Open pit	35.9	41.7	37.8	50
Minas Centrais	Open pit	25.9	36.0	37.6	72
Mariana	Open pit	11.3	26.7	33.1	86
Total Southeastern System		73.1	104.4	108.6	
Southern System					
Vargem Grande	Open pit	13.1	43.1	44.3	91
Paraopeba	Open pit	24.7	41.0	42.1	88
Total Southern System		37.8	84.1	86.4	
Northern System					
Serra Norte and Serra Leste	Open pit	115.3	135.6	147.0	96
Serra Sul	Open pit	73.4	58.0	22.2	100
Total Northern System		188.7	193.6	169.2	
Midwestern System					
Corumbá	Open pit	2.4	2.5	2.4	71
Urucum	Open pit	0.0	0.0	0.0	—
Total Midwestern System		2.4	2.5	2.4	
Total		302.0	384.6	366.5	

- (1) Production figures include third-party ore purchases, run of mine and feed for pelletizing plants. Segredo and João Pereira production are included as part of the Paraopeba Complex.
- (2) Percentage of the run-of-mine recovered in the beneficiation process. Process recovery figures do not include third-party ore purchases.

1.1.3 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. We also have a 25% interest in two iron ore pelletizing plants in China, *Zhuhai YPM Pellet Co., Ltd.* (“Zhuhai YPM”) and *Anyang Yu Vale Yongtong Pellet Co., Ltd.* (“Anyang”). Our total estimated nominal capacity is 64.7 Mtpy, including the full capacity of our pelletizing plants in Oman, but not including our joint ventures Samarco, Zhuhai YPM and Anyang.

Company/Plant	Description/History	Nominal capacity (Mtpy)	Power source	Other information	Vale's equity interest (%)	Partners
Brazil:						
Vale Tubarão (state of Espírito Santo).....	Three wholly owned pellet plants (Tubarão I, II and VIII) and five leased plants (Itabrasco, Hispanobras, Kobrasco and two Nibrasco plants). These plants receive iron ore primarily from our Southeastern System mines and use our logistics infrastructure for distribution.	36.7 (1)	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	Operations at the Tubarão I and Tubarão II pellet plants were suspended in October 2019 in response to market conditions.	100.0	—
Fábrica (state of Minas Gerais)	Part of the Southern System. Receives iron ore from the Paraopeba complex and purchases from third parties. Production is mostly transported by MRS and EFVM.	4.5	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	Operations at the Fábrica plant have been suspended since February 2019, following a determination of the ANM (see <i>Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine</i>).	100.0	—
Vargem Grande (state of Minas Gerais).....	Part of the Southern System. Receives iron ore from the Vargem Grande complex. Production is mostly transported by MRS.	7.0	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	Operations at the Vargem Grande plant have been suspended since February 2019, following a determination of the ANM (see <i>Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine</i>).	100.0	—
São Luís (state of Maranhão)	Part of the Northern System. Receives iron ore from the Carajás mines. Production is shipped to customers through our Ponta da Madeira maritime terminal.	7.5	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	Operation at the São Luís plant restarted in the second half of 2018. Operations at this plant had been suspended since 2012.	100.0	—
Oman:						
Vale Oman Pelletizing Company LLC.....	Vale's industrial complex. Two pellet plants with a 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.	9.0	Supplied through the national electricity grid.	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.	70.0	Oman Oil Company S.A.O.C.

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

1.1.4 Iron ore pellets production

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

Company	Production for the year ended December 31,		
	2019	2018	2017
	(million metric tons)		
Vale(1)	41.8	55.3	50.3
Total	41.8	55.3	50.3

(1) These figures correspond to 100% production from our pellet plants in Oman and the five pellet plants we lease in Brazil, and are not adjusted to reflect our ownership. The operating leases for the Itabrasco and Hispanobras pellet plants expire in 2020, the operating lease for the Nibrasco pellet plant expires in 2022 and the operating leases for the Kobrasco pellet plant expire in 2033.

1.1.5 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 2019, China accounted for 61% of our iron ore and iron ore pellet shipments, and Asia as a whole accounted for 75%. Europe accounted for 12%, Brazil accounted for 8%, followed by the Middle East with 5%. Our ten largest customers collectively purchased 134 million metric tons of iron ore and iron ore pellets from us, representing 43% of our 2019 iron ore and iron ore pellet sales volumes and 42% of our total iron ore and iron ore pellet revenues. In 2019, no individual customer accounted for more than 10% of our iron ore and iron ore pellet shipments.

Of our 2019 pellet production, 55% was blast furnace pellets and 45% was direct reduction pellets. Blast furnace and direct reduction are different technologies employed by steel mills to produce steels, each using different types of pellets. In 2019, the Asian market (mainly Japan), the European market and the Brazilian market 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 ore 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 ore 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, and an office in Brazil, which supports sales to South America. 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 2019, we hedged part of our total exposure to bunker oil prices relating to long-term contracts of affreightment connected to our FOB and CFR international and domestic sales.

1.1.6 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, Rio Tinto Ltd ("Rio Tinto") and Fortescue Metals Group Ltd.

We are competitive in the Asian market for two main reasons. 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. 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 seventeen 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 2019, the 62% Fe low-alumina index traded with a premium of US\$1.07 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 seventeen distribution centers in China, which reduces the time to reach Asian markets and increases our distribution capillarity by using smaller vessels. In 2019, we announced the launch of the GF88, a new product to supply the growing market of pellet production in China, which consists of Carajás fines (IOCJ) obtained through a grinding process, opening a new market for our high quality portfolio.

- *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, but also 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. ("Gerdau"), Companhia Siderúrgica Nacional ("CSN"), 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 and Bahrain Steel.

1.2 Manganese ore and ferroalloys

1.2.1 Manganese ore operations and production

We conduct our manganese mining operations in Brazil through Vale S.A. and our wholly owned subsidiaries Vale Manganês S.A. ("Vale Manganês") and MCR. Our mining operations are carried out under concessions from the federal government granted for an indefinite period. Our mines produce metallurgical ore, used primarily for the production of manganese ferroalloys, a raw material used to produce carbon and stainless steel.

Mining complex	Company	Location	Description/History	Mineralization	Operations	Power source	Access/Transportation
Azul	Vale S.A.	State of Pará	Open-pit mining operations and on-site beneficiation plant.	High- and medium-grade oxide-ores (24-46% manganese grade).	Crushing, scrubbing and classification steps, producing lumps and fines.	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	Manganese ore is transported by truck and EFC railroad to the Ponta da Madeira maritime terminal.
Morro da Mina ...	Vale Manganês	State of Minas Gerais	Open-pit mining operations and concentration plant.	Medium- and low-grade silicocarbonate ores (an average content of 30% manganese grade).	Crushing, screening and dense-heavy medium separation DMS / HMS process producing lumps to the Barbacena and Ouro Preto ferroalloy plants.	Supplied through the national electricity grid. Acquired from regional utility companies.	Manganese ore is transported by truck to the Barbacena and Ouro Preto ferroalloy plants.
Urucum	MCR	State of Mato Grosso do Sul	Underground mining operations and on-site beneficiation plant.	High-and medium-grade oxide ores (an average content of 46% manganese grade).	Crushing, scrubbing and classification steps, producing lumps and fines.	Supplied through the national electricity grid. Acquired through power purchase agreements.	Manganese ore is transported by barge traveling along the Paraguay and Paraná rivers to transhippers at the Nueva Palmira port in Uruguay.

The following table sets forth information about our manganese ore production, obtained after beneficiation process, and mass recovery.

Mine	Type	Production for the year ended December 31,			2019 process recovery(1)
		2019	2018	2017	
		(million metric tons)			
Azul.....	Open pit	1.0	1.0	1.4	40
Morro da Mina	Open pit	0.2	0.1	0.1	76
Urucum	Underground	0.4	0.7	0.7	82
Total.....		1.6	1.8	2.2	

(1) Percentage of the run-of-mine recovered in the beneficiation process.

1.2.2 Manganese ferroalloys operations and production

We conduct our manganese ferroalloys business through our wholly owned subsidiary Vale Manganês. The production of manganese ferroalloys consumes significant amounts of electricity, which is provided through power purchase agreements.

We produce several types of manganese ferroalloys, such as high carbon and medium carbon ferro-manganese and ferro-silicon manganese.

Plant	Location	Description/History	Nominal capacity	Power source
Minas Gerais Plants	Cities of Barbacena and Ouro Preto	Barbacena has seven furnaces, two of which are refining furnaces and a briquetting plant. Ouro Preto has three furnaces, two of which are currently not operating due to market conditions.	Barbacena: 66,000 metric tons per year (54,000 metric tons per year of ferro-silicon manganese and 12,000 metric tons per year of ferro-manganese medium carbon). Ouro Preto: 64,000 metric tons per year of ferro-silicon manganese.	Supplied through the national electricity grid. Acquired from Furnas—Centrais Elétricas S.A. or through power purchase agreements.
Bahia Plant	City of Simões Filho	Four furnaces, two converters and a sintering plant.	135,000 metric tons per year (42,000 metric tons per year of ferro-silicon manganese and 93,000 metric tons per year of high carbon ferro-manganese). The plant has a capacity to refine until 40,000 metric tons per year of ferro-manganese high carbon to produce ferro-manganese medium carbon alloy, according to market demand.	Supplied through the national electricity grid. Acquired from Companhia Hidrelétrica do São Francisco (CHESF) or through power purchase agreements.

The following table sets forth information about our manganese ferroalloys production.

Plant	Production for the year ended December 31(1),		
	2019	2018	2017
	(thousand metric tons)		
Barbacena	54	55	58
Ouro Preto	11	10	3
Simões Filho	86	103	88
Total	151	168	149

(1) Production figures reflect hot metal, which is further processed by a crushing and screening facility. Average mass recovery in this process is 85%.

1.2.3 Manganese ore and ferroalloys: sales and competition

The markets for manganese ore and ferroalloys are highly competitive. Competition in the manganese ore market takes place in two segments. High- and medium-grade manganese ore competes on a global seaborne basis, while low-grade ore competes on a regional basis. For some manganese ferroalloys, especially ferromanganese, higher-grade manganese ores are required to achieve competitive quality and cost, while medium- to lower-grade ores may be used in silicomanganese production. The main suppliers of high-grade ores are located in South Africa, Gabon, Australia and Brazil. The main producers of low-grade ores are located in the Ukraine, China, South Africa, Ghana, Kazakhstan, India and Mexico.

We compete in the seaborne market with both high- and medium-grade ores from the Azul and Urucum mines, where we benefit from extensive synergies with our iron ore operations, from mine to rail to port to vessel operations. Our main competitors in this segment are South32 (Australia and South Africa) and Eramet (Gabon). Our lower-grade ores, especially those from Morro da Mina, are consumed internally in our ferroalloy smelters.

The manganese ferroalloy market is characterized by a large number of participants who compete primarily on the basis of price. Our competitors are located principally in countries that produce manganese ore or carbon steel. Potential entrants and substitutes come from silicon or chrome ferroalloys, which can occasionally shift their furnaces to manganese alloys, and from electrolytic manganese producers. Competitors may be either integrated smelters like us, who feed manganese ore from their own mines, or non-integrated smelters. The principal competitive factors in this market are the costs of manganese ore, electricity, logistics and reductants such as coke, coal and charcoal. We compete with both stand-alone and integrated producers.

Focusing mainly in the Brazilian, South and North American steelmaking customers, our ferroalloys operations also benefit from synergies with our iron ore sales, marketing, procurement and logistics activities. We buy our energy and coke supplies at reasonable market prices both through medium- and long-term contracts. Competitors in the Brazilian market are about a dozen smelters with capacities from five to 90 thousand metric tons per year, most of which are not integrated and some of which are customers of our manganese ores. We have a distinctive advantage in comparison to them in producing ferroalloys with higher manganese content.

2. BASE METALS

2.1 Nickel

2.1.1 Operations

We conduct our nickel operations primarily through our wholly owned subsidiary Vale Canada Limited, which operates two nickel production systems, one in the North Atlantic region and the other in the Asia Pacific region. We also produce copper as a coproduct in our nickel operations in Canada and, through Vale S.A., operate a third nickel production system, Onça Puma, in the South Atlantic region. Our nickel operations are set forth in the following table.

Company/Mining System	Location	Description/History	Operations	Mining title	Power source	Access/ Transportation
<i>North Atlantic:</i>						
Vale Canada	Canada — Sudbury, Ontario	Integrated mining, milling, smelting and refining operations to process ore into finished nickel with a nominal capacity of 66,000 metric tons of refined nickel per year and additional nickel oxide feed for the refinery in Wales. Mining operations in Sudbury began in 1885. We acquired the Sudbury operations in 2006.	<i>Nickel.</i> Primarily underground mining operations with nickel sulfide ore bodies, which also contain some copper, cobalt, PGMs, gold and silver. We also process external feeds from third parties and from our Thompson operation. In addition to producing finished nickel in Sudbury, we ship a nickel oxide intermediate product to our nickel refinery in Wales for processing to final products. <i>Copper.</i> We produce two intermediate copper products, copper concentrate and copper matte, and we also produce a finished electrowon copper cathode product.	Patented mineral rights with no expiration date; mineral leases expiring between 2020 and 2040; and mining licenses of occupation with indefinite expiration date(1).	Supplied by Ontario's provincial electricity grid and produced directly by Vale via hydro generation.	Located by the Trans-Canada highway and the two major railways that pass through the Sudbury area. Finished products are delivered to the North American market by truck. For overseas customers, the products are loaded into containers and travel intermodally (truck/rail/containership) through both east and west coast Canadian ports.
Vale Canada	Canada — Thompson, Manitoba	Mining and milling operations to process ore into nickel concentrate. We phased out smelting and refining activities in Thompson during 2018. Thompson mineralization was discovered in 1956, and Thompson operations were acquired by us in 2006.	<i>Nickel.</i> Primarily underground mining operations with nickel sulfide ore bodies, which also contain some copper and cobalt. Since the second half of 2018, we have started sending the majority of the nickel concentrate from Thompson to be refined in Sudbury.	Order in Council leases expiring between 2021 and 2025; mineral leases expiring in 2034(2).	Supplied by Manitoba's provincial utility company.	Intermediate concentrates are delivered in Ontario.
Vale Newfoundland & Labrador Limited	Canada — Voisey's Bay and Long Harbour, Newfoundland and Labrador	Integrated open-pit mining and milling operation at Voisey's Bay producing nickel and copper concentrates with refining of nickel concentrate at Long Harbour into finished metal products with an expected nominal capacity of approximately 50,000 metric tons of refined nickel per year upon ramp-up. Voisey's Bay's operations started in 2005 and was purchased by us in 2006.	Comprised of the Ovoid open pit mine, and deposits for underground operations at a later stage. We mine nickel sulfide ore bodies, which also contain copper and cobalt. The Long Harbour facility continued to ramp up in 2019 while processing feed from Voisey's Bay concentrate exclusively. Copper concentrate from the open pit mine is sold directly to the market.	Mining lease expiring in 2027, with a right of further renewals for 10-year periods.	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.	The nickel and copper concentrates from Voisey's Bay are transported to the port by haulage trucks and then shipped by dry bulk vessels to either overseas markets or to our Long Harbour operations for further refining.
Vale Europe Limited	U.K. — Clydach, Wales	Stand-alone nickel refinery (producer of finished nickel), with nominal capacity of 40,000 metric tons per year. The Clydach refinery commenced operations in 1902 and was acquired by us in 2006.	Processes a nickel intermediate product, nickel oxide, supplied from our Sudbury and Matsuzaka operations to produce finished nickel in the form of powders and pellets.	—	Supplied through the national electricity grid.	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.

Company/Mining System	Location	Description/History	Operations	Mining title	Power source	Access/ Transportation
<i>Asia/Pacific</i>						
PT Vale Indonesia Tbk ("PTVI")	Indonesia — Sorowako, Sulawesi	Open cast mining area and related processing facility (producer of nickel matte, an intermediate product) with a nominal capacity of approximately 80,000 metric tons of nickel in matte per year. PTVI's shares are traded on the Indonesia Stock Exchange. We indirectly hold approximately 59% of PTVI's share capital, Sumitomo Metal Mining Co., Ltd ("Sumitomo") and an affiliate hold approximately 20%, and the public holds approximately 20%. PTVI was established in 1968, commenced its commercial operations in 1978, was listed on the Indonesian stock exchange in 1990 and was acquired by us in 2006.	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 80% of its production to our wholly owned subsidiary Vale Canada and 20% of its production to Sumitomo.	Contract of work expiring in 2025, entitled to two consecutive ten-year extensions, in the form of a business license, subject to approval of the Indonesian government.(3)	Produced primarily by PTVI's low-cost hydroelectric power plants on the Larona River (there are currently three facilities). PTVI has thermal generating facilities in order to supplement its hydroelectric power supply with a source of energy that is not subject to hydrological factors.	Trucked approximately 55 km to the river port at Malili and then loaded onto barges in order to load break-bulk vessels for onward shipment.
Vale Nouvelle-Calédonie S.A.S. ("VNC")	New Caledonia — Southern Province	Mining and processing operations (producer of nickel oxide, nickel hydroxide and cobalt carbonate). We hold 95% of VNC's shares and the remaining 5% is held by Société de Participation Minière du Sud Calédonien S.A.S. ("SPMSC"). SPMSC has the option to increase its stake in VNC up to 5% within ten years from the date of the shareholders' agreement signed on April 29, 2019(4).	VNC utilizes a high-pressure acid leach process to treat limonitic and saprolitic laterite ores. After April 2020, VNC will no longer produce nickel oxide, only keeping production of hydroxide cake.	Mining concessions expiring between 2022 and 2051(5).	Supplied through the national electricity grid and by independent producers.	Products are packed into containers and are trucked approximately 4 km to Prony port and shipped by ocean container.
Vale Japan Limited	Japan — Matsuzaka	Stand-alone nickel refinery (producer of intermediate and finished nickel), with a nominal capacity of 60,000 metric tons per year. We own 87.2% of the shares, and Sumitomo owns the remaining shares. The refinery was built in 1965 and was acquired by us in 2006.	Produces intermediate products for further processing in our refineries in Asia and the UK, and finished nickel products using nickel matte sourced from PTVI.	—	Supplied through the national electricity grid. Acquired from regional utility companies.	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.
Vale Taiwan Limited	Taiwan — Kaoshiung	Stand-alone nickel refinery (producer of finished nickel), with nominal capacity of 18,000 metric tons per year. The refinery commenced production in 1983 and was acquired by us in 2006.	Produced finished nickel for the stainless steel industry, primarily using intermediate products from our Matsuzaka and New Caledonian operations. We suspended operations at this plant in 2017 due to market conditions and it currently remains under care and maintenance.	—	Supplied through the national electricity grid. Acquired from regional utility companies.	Trucked over public roads to customers in Taiwan. For overseas customers, the product is loaded into containers at the plant and shipped from the port of Kaoshiung.
Vale Nickel (Dalian) Co., Ltd	China — Dalian, Liaoning	Stand-alone nickel refinery (producer of finished nickel), with nominal capacity of 32,000 metric tons per year. We own 98.3% of the equity interest and Ningbo Sunhu Chemical Products Co., Ltd. owns the remaining 1.7%. The refinery commenced production in 2008.	Produces finished nickel for the stainless steel industry, primarily using intermediate products from our Matsuzaka and New Caledonian operations.	—	Supplied through the national electricity grid. Acquired from regional utility companies.	Product transported over public roads by truck and by railway to customers in China. It is also shipped in ocean containers to overseas and some domestic customers.

Lines of Business

Company/Mining System	Location	Description/History	Operations	Mining title	Power source	Access/ Transportation
<i>South Atlantic</i> Vale/Onça Puma	Brazil — Ourilândia do Norte, Pará	Mining and smelting operation producing a high-quality ferronickel for application within the stainless steel industry.	The Onça Puma mine is built to recover nickel from saprolitic ore deposit. The operation produces ferronickel via the 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 will evaluate opportunities to restart the second line operations in light of market conditions and the associated business case. See <i>Additional Information — Legal proceedings — Onça Puma litigation</i> .	Mining concession for indefinite period.	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	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.

- (1) We submitted applications for renewal of leases in Sudbury expiring in 2020 and the approval process is ongoing. All conditions required for the renewal under the Ontario Mining Act have been fulfilled. This process usually takes a number of years, and we can continue to operate while the approval process is ongoing.
- (2) With respect to Order in Council leases expiring in 2020, Vale Canada Limited negotiated an extension for a period of one year from the original expiry date. Vale is negotiating with the Government of Manitoba the renewal of the mineral rights in accordance with the Mines and Minerals Act of Manitoba, the Mineral Disposition and Mineral Lease Regulation, 1992.
- (3) The contract of work between PTVI and the Indonesian government will expire in 2025, after which date PTVI will continue its operation in the form of a 10-year business license provided certain obligations are satisfied. PTVI can apply for a further 10-year extension to the extent that it is in compliance with predefined requirements. Under the contract of work, PTVI agreed to divest 20% of its shares to Indonesian participants within five years from the issuance of a regulation dated October 2014 (approximately 20% of PTVI's shares are already publicly traded and listed on the Indonesian stock exchange). In October 2019, PTVI, together with its shareholders, Vale Canada and Sumitomo, signed a non-binding heads of agreement regarding PTVI's divestment with PT Indonesia Asahan Aluminium (Paser) ("Inalum"), a state-owned mining holding company which oversees the state mining investments. The shareholders have agreed to satisfy the 20% interest divestment obligations and Inalum has been appointed by the Government of the Republic of Indonesia to acquire this stake. The parties are negotiating the definitive agreements.
- (4) In April 2019, Vale Canada and Société de Participation Minière du Sud Calédonien S.A.S ("SPMSC") entered into a Shareholders Agreement ("SHA") to replace and supersede the shareholders' agreement dated February 2005, as amended. Among other things, the SHA provides SPMSC with an option to increase its stake in VNC up to an additional 5% within ten years as of the date of the SHA at a strike price (set for the first five years and increasing by the U.S. consumer price index on a yearly basis starting in year six). The SHA also includes anti-dilution provisions where SPMSC can only be diluted below 5% ownership in specified circumstances.
- (5) VNC has requested the renewal of some concessions that were scheduled to expire before 2018. All conditions required for the renewal have been fulfilled. This process usually takes a number of years and we can continue to operate while the approval process is ongoing.

2.1.2 Production

The following table sets forth our annual mine production by operating mine (or, on an aggregate basis in the case of the Sulawesi operating areas operated by PTVI in Indonesia, because it is organized by mining areas rather than individual mines) and the average percentage grades of nickel and copper. The mine production at Sulawesi represents the product from PTVI's screening station delivered to PTVI's processing plant and does not include nickel losses due to drying and smelting. For our Sudbury, Thompson and Voisey's Bay operations, the production and average grades represent the mine product delivered to those operations' respective processing plants and do not include adjustments due to beneficiation, smelting or refining. For our Onça Puma operation in Brazil and VNC operation in New Caledonia the production and average grade represents in-place ore production and does not include losses due to processing.

	2019(1)			2018(1)			2017		
	Production	Grade		Production	Grade		Production	Grade	
		Copper	Nickel		Copper	Nickel		Copper	Nickel
<i>Ontario operating mines</i>									
Copper Cliff North .	644	1.72	1.38	746	1.30	1.29	814	1.40	1.30
Creighton	613	2.67	2.68	608	2.77	2.55	595	2.91	3.17
Stobie				–	–	–	448	0.53	0.62
Garson	641	1.32	1.77	655	1.35	2.00	635	1.48	1.93
Coleman	1,102	3.80	1.47	618	3.31	1.40	1,007	3.76	1.53
Ellen				–	–	–	–	–	–
Totten	669	2.08	1.33	710	2.02	1.39	710	1.90	1.33
Total Ontario operations ...	<u>3,669</u>	<u>2.50</u>	<u>1.68</u>	<u>3,337</u>	<u>2.10</u>	<u>1.70</u>	<u>4,210</u>	<u>2.18</u>	<u>1.65</u>
<i>Manitoba operating mines</i>									
Thompson	859	–	1.78	1,034	–	2.05	1,229	–	1.94
Birchtree				–	–	–	329	–	1.30
Total Manitoba operations ...	<u>859</u>	<u>–</u>	<u>1.78</u>	<u>1,034</u>	<u>–</u>	<u>2.05</u>	<u>1,557</u>	<u>–</u>	<u>1.81</u>
<i>Voisey's Bay operating mines</i>									
Ovoid	<u>2,116</u>	<u>1.19</u>	<u>2.21</u>	<u>1,895</u>	<u>1.32</u>	<u>2.37</u>	<u>2,378</u>	<u>1.44</u>	<u>2.56</u>
<i>Sulawesi operating mines</i>									
Sorowako(2)	<u>4,286</u>	<u>–</u>	<u>1.89</u>	<u>4,469</u>	<u>–</u>	<u>1.90</u>	<u>4,569</u>	<u>–</u>	<u>1.89</u>
<i>New Caledonia operating mines</i>									
VNC(2)	<u>2,495</u>	<u>–</u>	<u>1.54</u>	<u>2,620</u>	<u>–</u>	<u>1.46</u>	<u>3,030</u>	<u>–</u>	<u>1.47</u>
<i>Brazil operating mines</i>									
Onça Puma(3)	<u>321</u>	<u>–</u>	<u>1.40</u>	<u>–</u>	<u>–</u>	<u>–</u>	<u>964</u>	<u>–</u>	<u>2.05</u>

(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.

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

The following table sets forth 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 ore-source basis.

Mine	Type	Finished production by ore source for the year ended December 31,		
		2019	2018	2017
(thousand metric tons contained nickel)				
Sudbury	Underground	50.8	50.6	61.9
Thompson	Underground	11.3	14.8	23.0
Voisey's Bay(1)	Open pit	35.4	38.6	51.8
Sorowako(2)	Open cast	68.2	72.1	73.1
Onça Puma	Open pit	11.6	22.9	24.7
New Caledonia(3)	Open pit	23.4	32.5	40.3
External(4)	-	7.3	13.1	13.1
Total(5)		208.0	244.6	288.2

(1) Includes finished nickel produced at Long Harbour, Sudbury and Thompson.

(2) These figures have not been adjusted to reflect our ownership. We have a 59.28% interest in PTVI, which owns the Sorowako mines.

(3) These figures have not been adjusted to reflect our ownership. We have a 95.0% interest in VNC.

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

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

2.1.3 Customers and sales

Our nickel customers are broadly distributed on a global basis. In 2019, 42% of our refined nickel sales were delivered to customers in Asia, 21% to Europe, 32% to North America and 5% to other markets. We have short-term fixed-volume contracts with customers for the majority of our expected annual nickel sales. These contracts generally provide stable demand for a significant portion of our annual production.

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™ and Utility™ 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 2019, the principal first-use applications for primary nickel were:

- stainless steel (68% of global nickel consumption);
- non-ferrous alloys, alloy steels and foundry applications (18% of global nickel consumption);
- nickel plating (7% of global nickel consumption); and
- batteries (7% of global nickel consumption).

In 2019, 70% of our refined nickel sales were made into non-stainless steel applications, compared to the industry average for primary nickel producers of 32%. 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, based at our head office in Toronto (Canada). We also have 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 sites throughout Asia. For information about demand and prices, see *Operating and Financial Review and Prospects—Overview—Major factors affecting prices*.

2.1.4 Competition

The global nickel market is highly competitive. Our key competitive strengths include our long-life mines, our low cash costs of production relative to other nickel producers, 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 deliveries represented 9% of global consumption for primary nickel in 2019. 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 Nornickel, Glencore, Jinchuan Nonferrous Metals Corporation and Tsingshan Group and Jiangsu Delong Nickel. Together with us, these companies accounted for about 42% of global refined primary nickel production in 2019.

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 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.

The majority of the world nickel production is composed of Class II nickel products (55% of the global market in 2019), which include nickel pig iron (NPI, with nickel content under 15%). Most of our products are high quality nickel products, which makes Vale the supplier of choice for specialty nickel applications.

In 2019, 48% of our nickel products were Upper Class I, 12% were Lower Class I, 28% were Class II and 12% 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 and our relatively low production costs.

2.2.1 Operations

We conduct our copper operations at the parent-company level in Brazil and through our subsidiaries in Canada.

Mining complex/Location	Location	Description/History	Mineralization/Operations	Mining title	Power source	Access/Transportation
Brazil:						
Vale/Sossego	Carajás, state of Pará.	Two main copper ore bodies, Sossego and Sequeirinho, and a processing facility to concentrate the ore. Sossego was developed by Vale. Production started in 2004 and has a nominal capacity of approximately 93,000 tpy of copper in concentrates.	The copper ore is mined using the open-pit method, and the run-of-mine is processed by means of standard primary crushing and conveying, SAG milling (a semi-autogenous mill that uses a large rotating drum filled with ore, water and steel grinding balls to transform the ore into a fine slurry), ball milling, copper concentrate flotation, tailings disposal, concentrate thickening, filtration and load out.	Mining concession for an indefinite period.	Supplied through the national electricity grid. Produced directly by Vale or acquired through power purchase agreements.	We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Itaquí Port in São Luís, state of Maranhão. We constructed an 85-kilometer road to link Sossego to Parauapebas.
Vale/Salobo	Carajás, state of Pará.	Salobo I processing plant started production in 2012 and has a total capacity of 12 Mtpy of ore processed. The open pit mine and mill concluded their ramp up in the fourth quarter of 2016 to a capacity of 24 Mtpy of ore processed with the full implementation of Salobo II expansion. Salobo I and II have a total capacity of approximately 197,000 tpy of copper in concentrates.	Our Salobo copper mine is mined using the open-pit method, and 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.	Mining concession for an indefinite period.	Supplied through the national electricity grid. Acquired through power purchase agreements.	We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Itaquí Port in São Luís, state of Maranhão. We constructed a 90-kilometer road to link Salobo to Parauapebas.
Canada:						
Vale Canada.....	Canada—Sudbury, Ontario		See—Base metals—Nickel—Operations			
Vale Canada/ Voisey's Bay.	Canada—Voisey's Bay, Newfoundland and Labrador		See—Base 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 in-place ore production and do not include losses due to processing. For the annual production of copper as a coproduct in our nickel operations, see—*Base metals—Nickel—Production*.

	2019(1)		2018(1)		2017(1)	
	Production	Grade	Production	Grade	Production	Grade
<i>Brazil</i>						
Sossego	11,735	0.79	15,664	0.72	12,380	0.81
Salobo	48,468	0.69	50,963	0.69	61,573	0.63
Total	60,202	0.71	66,627	0.70	73,953	0.66

(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,		
		2019	2018	2017
(thousand metric tons)				
<i>Brazil:</i>				
Sossego	Open pit	66	92	100
Salobo	Open pit	189	193	193
<i>Canada: (as coproduct of nickel operations)</i>				
Sudbury	Underground	93	72	98
Voisey's Bay	Open pit	25	26	34
Thompson	Underground	1	1	2
External(1)	—	7	11	12
Total		381	395	439

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

2.2.3 Customers and sales

We sell copper concentrates from Sossego and Salobo under medium- and long-term contracts to copper smelters in Europe, India and Asia. We have medium-term copper supply agreements with domestic customer for part of the copper concentrates and copper matte produced in Sudbury, which are also sold under long-term contracts in Europe and Asia. We sell copper concentrates from Voisey's Bay under medium and long-term contracts to customers in Europe and electrowon copper cathodes from Sudbury and Long Harbour in North America under short-term sales agreements.

2.2.4 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 producers are Jiangxi Copper Corporation Ltd., Corporación Nacional del Cobre de Chile ("Codelco"), Tongling Non-Ferrous Metals Group Co., Freeport McMoRan Copper & Gold Inc., Aurubis AG and Glencore, 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, Glencore, BHP Billiton, Codelco, Anglo American, Antofagasta plc, Rio Tinto and First Quantum; each operating at the parent-company level or through subsidiaries. Our market share in 2019 was about 2% of the total copper concentrate market.

2.3 PGMs and other precious metals

As byproducts 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. The refinery in Acton, England, where our PGM intermediates and PGM feeds purchased from third parties were processed was closed in 2018 as part of business optimization, and the PGM concentrates from our Port Colborne operation are being sold to third parties. Gold and silver intermediates are also 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.

In February 2013, we sold to Wheaton Precious Metals Corp. (formerly Silver Wheaton) (“Wheaton”) 25% of the gold produced as a byproduct at our Salobo copper mine, in Brazil, for the life of mine, and 70% of the gold produced as a byproduct at our Sudbury nickel mines, in Canada, for 20 years. In each of March 2015 and August 2016, we sold to Wheaton an additional 25% of the gold produced as a byproduct at our Salobo copper mine. In consideration for the August 2016 sale, we received an initial cash payment of US\$800 million, an option value of approximately US\$23 million from a reduction of the exercise price of the warrants of Wheaton held by Vale since 2013, and ongoing payments of the lesser of US\$400 per ounce (subject to a 1% annual inflation adjustment starting January 1, 2019) and the prevailing market price, for each ounce of gold that we deliver under the agreement. We may receive an additional cash payment if we expand our capacity to process Salobo copper ores to more than 28 Mtpy before 2036. The additional cash payment may range from US\$113 million to US\$953 million, depending on ore grade, timing and size of the expansion. See *Overview—Business overview—Significant changes in our business*. Pursuant to the gold stream contract, Wheaton received 290,000 oz. of gold in 2019. In February 2020, we sold all of our warrants of Wheaton (equivalent to 10,000,000 common shares) for US\$2.50 per warrant, totaling US\$25 million.

The following table sets forth information on the contained volume of precious metals and platinum group metals (PGMs) as a byproduct of our production of nickel and copper concentrates.

Mine	Type	2019	2018	2017
		(thousand troy ounces of contained metal)		
Sudbury(1):				
Platinum.....	Underground	148	135	144
Palladium.....	Underground	182	218	214
Gold(2).....	Underground	69	57	74
Salobo:				
Gold(2).....	Open pit	368	361	346
Sossego:				
Gold.....	Open pit	43	59	65

- (1) Includes metal produced from unrelated parties feed purchases. Includes production out of Ontario (Canada) and Acton (England) production. Excludes tolling from unrelated parties.
- (2) Figures represent 100% of Salobo and Sudbury contained volume of gold as a byproduct 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 byproduct of our nickel operations. In 2019, we produced 1,092 metric tons of refined cobalt metal (in the form of cobalt rounds) at our Port Colborne refinery, 1,583 metric tons of cobalt rounds at our Long Harbour refinery, and 1,703 metric tons of cobalt in a cobalt-based intermediate product in New Caledonia. We sell cobalt on a global basis. The cobalt metal and the Long-Harbour cobalt rounds are electro-refined 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, as well as the manufacture of cobalt-based chemicals.

In June 2018, we sold to Wheaton and Cobalt 27 Capital Corp. ("Cobalt 27") a combined 75% of the cobalt produced as a byproduct 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 20%, on average, of cobalt prices upon delivery. Vale remains 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. In addition, we plan to begin marketing our cobalt streams in 2021, once current offtakes are concluded. The following table sets forth information on our cobalt production.

Mine	Type	Finished production by ore source for the year ended December 31,		
		2019	2018	2017
(contained metric tons)				
Sudbury.....	Underground	495	520	840
Thompson.....	Underground	80	198	138
Voisey's Bay.....	Open pit	1,608	1,902	1,829
New Caledonia.....	Open pit	1,703	2,104	2,780
Others(1).....	—	490	371	224
Total.....		4,376	5,093	5,811

- (1) 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 6 metric tons in 2017, 173 metric tons in 2018 and 313 metric tons in 2019.

3. COAL

3.1 Operations

We produce metallurgical and thermal coal through our subsidiary Vale Moçambique, which operates the Moatize mine.

Company/ Mining complex	Location	Description/History	Mineralization/ Operations	Mining title	Power source	Access/ Transportation
Vale Moçambique						
Moatize	Tete, Mozambique	Open-cut mine, which was developed directly by Vale. Operations started in August 2011 and are expected to reach a nominal production capacity of 22 Mtpy, considering the Moatize expansion, comprised of metallurgical and thermal coal and the Nacala Logistics Corridor ramp-up. Vale has an indirect 80.75% stake, Mitsui has an indirect 14.25% stake and the remaining is owned by Empresa Moçambicana de Exploração Mineira, S.A.	Produces metallurgical and thermal coal. Moatize's main branded products are the MLV premium hard coking coal and Moatize Low Vol Premium hard coking coal, but there is operational flexibility for multiple products. The optimal product portfolio will come as a result of market trials. Coal from the mines is currently processed at a CHPP with a capacity of 4,000 metric tons per hour. An additional CHPP began production in August 2016, which increased feed capacity by additional 4,000 metric tons per hour.	Mining concession expiring in 2032, which may be extended for an additional 25-year period, subject to approval by the government of Mozambique.	Supplied by local utility company. Back up supply on site.	The coal is transported from the mine to the port at Nacala-à-Velha via the Nacala Logistics Corridor.

3.2 Production

The following table sets forth information on our marketable coal production.

Operation	Mine type	Production for the year ended December 31,		
		2019	2018	2018
(thousand metric tons)				
Metallurgical coal:				
Moatize(1)	Open-cut	4,032	6,161	6,953
Thermal coal:				
Moatize(1)	Open-cut	4,738	5,444	4,307

(1) These figures correspond to 100% production at Moatize and are not adjusted to reflect our ownership.

3.3 Customers and sales

Coal sales from our Moatize operations, in Mozambique, target global steel and energy markets, including Asia, Africa, Europe and the Americas. Our office in India supports our sales of coal to the Indian market.

3.4 Competition

The global coal industry comprises markets for metallurgical and thermal coal and is highly competitive.

The demand for steel, especially in Asia, underpins demand for metallurgical coal, while demand for electricity underpins demand for thermal coal. Competitiveness in the coal industry is primarily based on the economics of production costs, coal quality, transportation costs and proximity to the market. Our key competitive strengths are a new and competitive transportation corridor and the size and quality of our reserves. The logistics facilities in Mozambique help us ensure that our products are delivered on time and at a relatively low cost in comparison to lengthy waits at the ports in Queensland, Australia and on the east coast of the United States. The properties of our coking coal make our product highly competitive.

Our main competitors in the metallurgical coal business are located in Australia and Canada and include subsidiaries, affiliates and joint ventures of BHP, Glencore, Anglo American, Peabody, Jellinbah Resources, among others. In the thermal coal business, our main competitors are located in Indonesia, South Africa, Australia, Colombia, USA, Russia and include subsidiaries affiliates and joint ventures of Glencore, Anglo American, Drummond Co, Pt Bumi Resources and PT Adaro, among others.

4. INFRASTRUCTURE

4.1 Logistics

We have developed our logistics business based on the transportation needs of our mining operations and we also provide transportation services for other customers. We conduct our logistics businesses at the parent-company level and through subsidiaries and joint ventures, as set forth in the table below.

Company	Business	Location	Our share of capital		Partners
			Voting	Total	
Vale	Railroad (EFVM and EFC), port and maritime terminal operations	Brazil	–	–	–
VLI(1)	Railroad, port, inland terminal and maritime terminal operations. Holding of certain general cargo logistics assets	Brazil	37.6	37.6	FI-FGTS, Mitsui and Brookfield
MRS	Railroad operations	Brazil	47.6	47.6	CSN, CSN Mineração, Usiminas Participações e Logísticas, Gerdau, Railvest Investments and public investors.
CPBS	Port and maritime terminal operations	Brazil	100	100	–
PTVI	Port and maritime terminal operations	Indonesia	59.2	59.2	Sumitomo, public investors
Vale Logística Uruguaya	Port operations	Uruguay	100	100	–
Central East African Railways (“CEAR”)(2)	Railroad	Malawi	46.2	46.2	Mitsui, investors
Corredor de Desenvolvimento do Norte (“CDN”)(2)	Railroad	Mozambique	46.2	46.2	Mitsui, investors
Corredor de Desenvolvimento do Norte—Porto (“CDN Porto”)(2)	Port and maritime terminal operations	Mozambique	46.2	46.2	Mitsui, investors
Corredor Logístico Integrado de Nacala S.A. (“CLN”)(3)	Railroad and port operations	Mozambique	50.0	50.0	Mitsui
Vale Logistics Limited (“VLL”)(4)	Railroad operations	Malawi	50.0	50.0	Mitsui
Transbarge Navegación	Paraná and Paraguay Waterway System (Convoys)	Paraguay	100	100	–
VNC	Port and maritime terminal operations	New Caledonia	95.0	95.0	SPMSC
VMM	Port and maritime terminal operations	Malaysia	100	100	–
Vale Newfoundland & Labrador Limited	Port operations	Voisey’s Bay and Long Harbour, in Newfoundland and Labrador	100	100	–
Vale Oman Distribution Center LLC	Port and maritime terminal operations	Oman	100	100	–

- (1) BNDES holds debentures issued by Vale that are exchangeable into part of our stake in VLI. Our equity interest in VLI may be reduced by up to 6.88% if BNDES exercises its rights under those debentures.
- (2) Vale holds its interest in CEAR, CDN and CDN Porto through a 50.0% interest in Nacala Corridor Holding Netherlands B.V., which indirectly owns 92.4% of these operating companies that comprise the NLC.
- (3) Vale holds its interest in CLN and VLL through a 50.0% interest in Nacala Corridor Holding Netherlands B.V., which indirectly owns 100% of these operating companies that comprise the NLC.

4.1.1 Railroads

Brazil

Vitória a Minas railroad ("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 888-kilometer railroad under a 30-year renewable concession, which expires in 2027. The EFVM railroad consists of two lines of track extending for a distance of 584 kilometers to permit continuous railroad travel in opposite directions, and single-track branches of 304 kilometers. Industrial manufacturers are located in this area and major agricultural regions are also accessible to it. VLI has rights to purchase railroad transportation capacity on our EFVM railroad. In 2019, the EFVM railroad transported a daily average of 229.5 thousand metric tons of iron ore and 59.5 thousand metric tons of other cargo. The EFVM railroad also carried 0.98 million passengers in 2019. In 2019, we had a fleet of 328 locomotives and 19,145 wagons at EFVM, which were operated by Vale 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 30-year renewable concession, which expires in 2027. EFC extends for 997 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 2019, the EFC railroad transported a daily average of 592.2 thousand metric tons of iron ore and 34.3 thousand metric tons of other cargo. EFC also carried 302 thousand passengers in 2019. EFC supports the largest train, in terms of capacity, in Latin America, which measures 3.5 kilometers, weighs 41.67 thousand gross metric tons when loaded and has 330 cars. In 2019, EFC had a fleet of 313 locomotives and 21,081 wagons, which were operated by Vale 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, ANTT (*Agência Nacional de Transportes Terrestres*).

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 37.6% stake in VLI, and are party to a shareholders' agreement with FI-FGTS, Mitsui and Brookfield, which hold the remaining equity interests in VLI. VLI's main assets are:

- *Ferrovias 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;
- *Ferrovias Norte-Sul railroad ("FNS")*. A 30-year renewable subconcession 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.

In 2019, VLI transported a total of 38.8 billion ntk of general cargo, including 20.7 billion ntk from FCA and FNS and 17.1 billion ntk through operational agreements with Vale.

MRS Logística S.A. ("MRS"). The MRS railroad, in which we have a 43.82% 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 2019, it transported a daily average of 233 thousand metric tons of iron ore and 169 thousand metric tons of other cargo.

Africa

The Nacala Logistics Corridor (NLC) connects the Moatize mine to the Nacala-à-Velha maritime terminal, located in Nacala, Mozambique, and crosses into the Republic of Malawi. The NLC consists of railway and port infrastructure, including greenfield and rehabilitation of existing railways in Mozambique and Malawi and a new coal port terminal in Mozambique. The NLC transports our coal products from the Moatize mine to our maritime terminal and supports our operations in Southeastern Africa. In Mozambique, we are operating under two concession agreements, one related to the Mozambican greenfield railway and another related to the newly constructed coal port, both held by our subsidiary Corredor Logístico Integrado de Nacala S.A. ("CLN"), which will expire in 2043, subject to renewal. We have also rehabilitated existing railroads under a concession held by our subsidiary, CDN, which will expire in 2035. In Malawi, we are operating under a concession held by our subsidiary, VLL, which will expire in 2046, subject to renewal, and we have also rehabilitated existing railroads under a concession held by our subsidiary, CEAR, which will expire in 2046. In 2019, the NLC transported a daily average of 23.9 thousand metric tons of coal and 1.4 thousand metric tons of other cargo. The NLC also carried 859 thousand passengers in 2019. In 2019, we had a fleet of 101 locomotives and 2,677 wagons at NLC, which were operated by CLN.

4.1.2 Ports and maritime terminals

Brazil

We operate ports and maritime terminals principally as a means to complete the delivery of our iron ore and iron ore pellets to bulk carrier vessels serving the seaborne market. See—*Ferrous minerals—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 located 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 Praia Mole port is also located in the Brazilian state of Espírito Santo.

- 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. Pier I can accommodate two vessels at a time, one of up to 170,000 DWT on the southern side and one of up to 210,000 DWT on the northern side. Pier II can accommodate one vessel of up to 405,000 DWT at a time, limited at 23 meters draft. In Pier I there are two ship loaders, which can load up to 13,500 metric tons per hour each. 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 iron ore maritime terminal has a storage yard with a capacity of 3.1 million metric tons. In 2019, 69.2 million metric tons of iron ore and iron ore pellets were shipped through the terminal for us.
- The *Terminal de Produtos Diversos* handled 6.5 million metric tons of grains and fertilizers in 2019. VLI has the right to purchase the capacity of the *Terminal de Produtos Diversos*.
- The *Terminal de Granéis Líquidos* handled 625 thousand metric tons of fuel in 2019. VLI has the right to purchase the capacity of the *Terminal de Granéis Líquidos*.
- The Praia Mole terminal is principally a coal terminal and handled 12.4 million metric tons of coal and other related cargo in 2019. VLI has the right to purchase the capacity of the Praia Mole terminal.

Ponta da Madeira maritime terminal. Our Ponta da Madeira maritime terminal is located 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 shiploaders, 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. 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 2018, Vale 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. In 2019, 190 million metric tons of iron ore 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). 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 2019, the terminal loaded 5.7 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 2019, the terminal loaded 21 million metric tons of iron ore.

VLI also operates Inácio Barbosa maritime terminal (TMIB), owned by Petrobras, in the Brazilian state of Sergipe; Santos maritime terminal (TIPLAM), in the Brazilian state of São Paulo, which is jointly owned by VLI and Vale Fertilizantes; and Pier II in the Itaquí Port, which can accommodate vessels of up to 155,000 DWT and has a maximum loading rate of 3,800 metric tons per hour for pig iron and of 3,000 metric tons per hour for grains.

Uruguay

Since October 2017, our subsidiary Vale Logística Uruguay S.A. (“VLU”) contracts third-party services to operate the Corporación Navios port terminal in the Nueva Palmira Free Zone in Uruguay. The port terminal provides facilities for the unloading, storing, weighing and loading of bulk materials from Corumbá, Brazil, by river barge for transshipment to ocean-going vessels destined for Brazilian, Asian and European markets. In 2019, we handled 1.3 million metric tons of iron and manganese ore through the Corporación Navios port.

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, copper 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.

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.

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, with total capacity of 12,000 DWT, 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 located in Lampia Village, South Sulawesi, with mooring buoys that can accommodate vessels with capacity of up to 20,000 DWT, and a terminal that can accommodate fuel tanker vessels with capacity of up to 5,000 DWT, totaling capacity of 25,000 DWT.

New Caledonia

We own and operate a port in Prony Bay, Province Sud, New Caledonia. This port has three terminals, including a passenger ferry terminal able to berth two ships up to 50m long, a dry bulk wharf where vessels of up to 58,000 DWT can unload at a rate of 8,000 metric tons per day and a general cargo wharf where vessels up to 200m long can berth. The general cargo wharf can move containers at a rate of seven per hour and liquid fuels (LPG, HFO, diesel) at a rate of 350 cubic meters per hour, and break-bulk. The port's container yard, covering an area of approximately 13,000 square meters, can receive up to 1,300 units. A bulk storage yard is linked to the port by a conveyor and has a storage capacity of 94,000 metric tons of limestone, 95,000 metric tons of sulfur, and 60,000 metric tons of coal.

Malaysia

Teluk Rubiah Maritime Terminal ("TRMT"). TRMT is located 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 2019, the terminal unloaded 24 million metric tons of iron ore and loaded 24 million metric tons of iron ore.

4.1.3 Shipping

Maritime shipping of iron ore and pellets

In 2019, we shipped approximately 217 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 (VLOCs). These vessels reduce energy consumption and greenhouse emissions by carrying an increased amount of cargo in a single trip, offering lower shipping costs. In 2019, approximately 84 million metric tons of iron ore products were transported under long term contracts of affreightment on VLOCs of 400,000 DWT and 325,000 DWT.

In light of the IMO regulation that limits global sulphur emissions to 0.5%, which became effective on January 2020, we negotiated the fitting of scrubbers on most of its dedicated fleet. These scrubbers will allow us to continue bunkering high-sulphur fuel oil, while complying with the new regulation. We expect 95% of our dedicated fleet to be scrubber-fitted by the end of 2022.

Paraná—Paraguay waterway system

Through our subsidiary, Transbarga Navegación, and other chartered convoys, we transport iron ore and manganese ores through the Paraná and Paraguay waterway system. The barges are unloaded in our local customers' terminals in Argentina or in a contracted terminal in the Nueva Palmira Free Zone in Uruguay, where we load the ore into ocean going vessels. We transported 2.1 million metric tons through the waterway system in 2019, including 0.6 million metric tons of ore through our local customers' terminals and 1.5 million metric tons of ore through a port in Uruguay.

Tugboats

We manage a fleet of 15 owned tugboats. We directly operate nine tugboats in the ports of Vitória and Mangaratiba, in the Brazilian states of Espírito Santo and Rio de Janeiro, respectively. We have a 50% stake in a consortium that operates five tugboats in the port of São Luís in the Brazilian states of Maranhão. We also own two tugboats in New Caledonia.

4.2 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 and minimizing the risk of energy shortages.

Brazil

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 2019, our installed capacity in Brazil was 1.8 GW, sourced from both directly and indirectly owned power plants. We use the electricity produced by these plants for our internal consumption needs. We currently own direct stakes in three hydroelectric power plants and three small hydroelectric power plants in operation. The hydroelectric power plant of Candonga, the operations of which remain suspended since November 2015 as a result of the rupture of the Samarco Dam, is located in the Southeastern region, Machadinho is located in the Southern region, and Estreito is located in the Northern region. The small hydroelectric power plants of Mello, Glória and Nova Maurício are located in the Southeastern region. In 2018, we sold the Ituerê hydroelectric power plant, located in the Southeastern region, due to its high required investments, low capacity and high cash cost when compared to our other assets. 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, Porto Estrela, Funil, Candonga, Aimorés, Capim Branco I, Capim Branco II, located in the Southeastern Region and, additionally, we have indirect stake in Santo Inácio, a Wind Complex located in the Brazilian state of Ceará, which started operations in December 2017. Part of the electricity generated by these assets is supplied to our operations through power purchase agreements with Aliança Geração.

In order to achieve electricity self-sufficiency in Brazil by 2025 and increase renewable energy sources, we signed a long-term energy supply contract for 20 years, which will be supplied by the Folha Larga Sul wind farm, a 151.2 MW project in Campo Formoso, Bahia, Brazil. This project is expected to begin commercial operation by the second half of 2020. The agreement also includes a future asset call option held by Vale. We also approved the construction of two wind farms (Gravier and Acauã) in the Brazilian states of Ceará and Rio Grande do Norte, respectively, through Aliança Geração. Projects have together 180.6 MW of installed capacity and will begin commercial operations by the end of 2021.

We also have a 4.59% indirect stake in Norte Energia S.A. (“Norte Energia”), 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 startup 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 entered into with Norte Energia.

We also produce, through our subsidiary Biopalma da Amazônia S.A.—Reflorestamento, Indústria e Comércio. (“Biopalma”), palm oil in the Brazilian state of Pará.

Canada

In 2019, our wholly owned and operated hydroelectric power plants in Sudbury generated 19% of the electricity requirements of our Sudbury operations. The power plants consist of five separate generation stations 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 2019, average demand for electrical energy was 168 MW to all surface plants and mines in the Sudbury area.

In 2019, diesel generation provided 100% of the electric requirements of our Voisey's Bay operations. We have six diesel generators on-site, 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.

5. Other investments

Below is a list of our main other investments:

- *Pelletizing plants.* We have a 25% stake in two iron ore pelletizing plants in China, Zhuhai YPM and Anyang. The remaining stake in Zhuhai YPM is owned by Zhuhai Yueyufeng Iron and Steel Co. Ltd. and Halswell Enterprises Limited, and the remaining stake in Anyang is owned by Anyang Iron & Steel Co., Ltd.
- *Nickel refinery.* We have a 25% indirect stake in Korea Nickel Corporation, which operates a nickel refinery in South Korea. The remaining stake is held by Korea Zinc Co., Ltd, Posteel Co., Ltd., Young Poong Co., Ltd., and others. Korea Nickel Corporation produces finished nickel for the stainless steel industry using intermediate products from our Matsuzaka and New Caledonia operations.
- *Steel producers.* We own a 50% stake in California Steel Industries, Inc. ("CSI"), a producer of flat-rolled steel and pipe products located in California, United States. The remainder is owned by JFE Steel. CSI's annual production capacity is approximately 2.8 million metric tons of flat and pipe products. We also own a 50% stake in Companhia Siderúrgica do Pecém ("CSP"), an integrated steel slab plant in the Brazilian state of Ceará in partnership with Dongkuk Steel Mill Co. and Posco, two major steel producers in South Korea. CSP's annual production capacity is 3.0 million metric tons.
- *Bauxite.* We own a 40% stake in Mineração Rio do Norte S.A. ("MRN"), a bauxite mining business located in Brazil.

- *Samarco*. We own a 50% stake in Samarco, an integrated system comprised of two mines, three beneficiation plants, three pipelines, four pellet plants and a port. The mines and the beneficiation plants are located 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 state production flows through the three pipelines which extend for approximately 400 Km. Samarco's mining and pelletizing operations have been suspended following the rupture of one of its tailings dams located in Minas Gerais in November 2015 (see *Overview—Business overview—Rupture of Samarco's tailings dam in Minas Gerais*).

RESERVES

PRESENTATION OF INFORMATION CONCERNING RESERVES

The estimates of proven and probable ore 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, and in accordance with the technical definitions established by the SEC. Under the SEC's Industry Guide 7:

- Reserves are the part of a mineral deposit that could be economically and legally extracted or produced at the time of the reserve determination.
- Proven (measured) reserves are reserves for which (i) quantity is computed from dimensions revealed in outcrops, trenches, workings or drill holes; grade and/or quality are computed from the results of detailed sampling; and (ii) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established.
- Probable (indicated) reserves are reserves for which quantity and grade and/or quality are computed from information similar to that used for proven (measured) reserves, but the sites for inspection, sampling and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.

We periodically revise our reserve estimates when we have new geological data, economic assumptions or mining plans. During 2019, 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 not been adjusted to reflect our proportional ownership interest. Certain figures in the tables, discussions and notes have been rounded. For a description of risks relating to reserves and reserve estimates, see *Overview—Risk factors*.

As a part of Vale internal governance process, we have a Mineral Resources and Mineral Reserves Global Committee coordinated by our Exploration and Mineral Projects department and composed of representatives of all business units (Ferrous, Coal and Base Metals) and the Sustainability, Investor Relations and Capital Projects departments. The purpose of these committee is ensuring the transparency, consistency, professional competence and reliability of all information prepared for internal purposes and public reporting. It is also responsible for overseeing the governance of our estimation and reporting of mineral reserves, which include external audits when applicable.

We continue to report our reserves in accordance with the SEC's Industry Guide 7, and we expect to start complying with the new SEC rules governing disclosures on mining properties, including reporting of reserves and resources in our annual report on Form 20-F for the fiscal year ending December 31, 2021. The new SEC rules align SEC disclosure requirements more closely with global regulatory practices and standards, as embodied in standards developed by CRIRSCO (Committee for Mineral Reserves International Reporting Standards). We already estimate our reserves under CRIRSCO standards. However, our reserves estimates may require revisions when reported pursuant to the new SEC standards, which is similar but more prescriptive in some points in comparison with CRIRSCO.

Our reserve estimates are based on certain assumptions about prices. We have determined that our reported reserves could be economically produced if prices for the products identified in the following

table were equal to the three-year average historical prices through December 31, 2019. For this purpose, we used the three-year historical average prices set forth in the following table.

Commodity	Three-year average historical price	Pricing source
<i>Iron ore:</i>		
Vale(1)	78.1 per dry metric ton	Average Platts IODEX (62% Fe CFR China)
<i>Coal:(2)</i>		
Metallurgical – Moatize	178.6 per metric ton	Platts PHCC (PLV)
Thermal – Moatize	71.5 per metric ton	Richards Bay FOB
<i>Base metals:</i>		
Nickel(3)	12,473 per metric ton	LME Ni
Copper	6,231 per metric ton	LME Cu
<i>Nickel and copper byproducts:</i>		
Platinum	897 per oz	Average realized price
Palladium	1,147 per oz	Average realized price
Gold	1,306 per oz	Average realized price
Cobalt(3)	57,868 per metric ton	99.3% low cobalt metal (source: Metal Bulletin)
<i>Manganese ore(4):</i>		
Manganese	6.3 per dry metric ton unit	Average CRU (44% Mn CFR China)

(1) The economic assessment of our iron ore reserves is based on the average of 62% Fe iron ore prices, as adjusted to reflect the effects of freight, moisture and the quality premium for our iron ore.

(2) As received basis (8% moisture).

(3) Premiums (or discounts) are applied to the nickel and cobalt spot prices at certain operations to derive realized prices. These premiums (or discounts) are based on product form, long-term contracts, packaging and market conditions.

(4) The economic assessment of our manganese ore reserves is based on the average CRU prices, adjusted to reflect the effects of freight, moisture and the quality premium for our manganese ore prices on a CFR China basis.

IRON ORE RESERVES

The tables below set forth our iron ore reserves and other information about our iron ore mines. Our reserve table reflects our production and operational plans, which are based on the facilities (consisting of both mines and processing plants) within each system, rather than the individual mines.

We classify our iron ore reserves as proven reserves to the extent that they satisfy the requirements of the definition of proven (measured) reserves, as described above, and that we have obtained the environmental licenses for the corresponding pit operation and 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 reserves in light of changes in the iron ore industry. We have determined that the Urucum and Corumbá mines are not economically viable based on three-year average historical prices. Accordingly, we are not reporting reserves at those facilities since 2015.

Variations in iron ore reserves from 2018 to 2019 reflect depletion resulting from mine production for all mines. Our reserves for N4, N5 and Serra Leste (located at the Serra Norte complex in our Northern System) and Segredo (located at the Paraopeba complex in our Southern System) have been positively affected by new geological information and estimates.

We are also reporting, for the first time, reserves for our Morro Agudo mine (located at the Minas Centrais complex in our Southeastern System). We are not in a position to disclose the corresponding reserves for Ferrous Resources Limited as the company is still in the process of being integrated into our operations.

After the completion of the integration process we will review the reserves estimates and the standards adopted for such estimates, pursuant to our rules for disclosure.

As a result of new regulations on dams and pursuant to our strategy, we are reviewing and modifying some of our long-term projects, and we are no longer reporting reserves for the Timbopeba Itabiritos and Alegria Adequação projects located at the Mariana complex in our Southeastern System and Pico Itabiritos, Fábrica Itabiritos and Fábrica Adequação projects in our Southern System, which results in a reduction of approximately 1.7 billion metric tonnes of total reserves. After conclusion of these studies and our strategic review, we may resume reporting reserves for those mines.

	Iron ore reserves(1) (As of December 31, 2019)							
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Southeastern System(2)								
Itabira(3)	418.9	47.3	377.4	44.2	796.2	45.8	861.4	45.7
Minas Centrais(4)	141.3	48.3	627.7	56.2	769.0	54.7	734.4	55.4
Mariana(5)	194.0	48.1	2,902.3	45.5	3,096.3	45.7	3,874.5	44.7
Total Southeastern System	754.2	47.7	3,907.5	47.1	4,661.6	47.2	5,470.4	46.3
Southern System(6)								
Vargem Grande(8)	645.3	49.7	2,843.5	46.2	3,488.8	46.8	4,021.6	46.4
Paraopeba(9)	184.9	52.8	436.6	54.9	621.5	54.2	1,364.3	45.0
Total Southern System	830.2	50.4	3,280.1	47.3	4,110.2	47.9	5,385.9	46.1
Northern System(10)								
Serra Norte(11)	596.1	66.2	2,227.6	65.3	2,823.7	65.5	2,019.9	65.9
Serra Sul(12)	1,871.5	66.2	2,326.6	66.4	4,198.1	66.3	4,288.1	66.3
Serra Leste	0.0	0.0	324.5	65.1	324.5	65.1	256.2	65.4
Total Northern System	2,467.6	66.2	4,878.7	65.8	7,346.3	65.9	6,564.1	66.1
Total Vale Systems	4,051.9	59.5	12,066.2	54.7	16,118.2	55.9	17,420.4	53.7

- (1) Iron Ore Reserve estimates stated as million metric tonnes inclusive moisture and dry %Fe grade; following moisture contents: Itabira 0.9%; Minas Centrais 5.7%; Mariana 4.0%; Vargem Grande 5.1%; Paraopeba 4.7%; Serra Norte 6.1%; Serra Sul 4.4%; Serra Leste 2.8%.
- (2) Approximate drill hole spacing used to classify the Reserves were: 100m × 100m to Proven Reserves and 200m × 200m to Probable Reserves. Average product recovery (tonnage basis) of the iron ore reserves are: 52% for Itabira, 84% for Minas Centrais and 63% for Mariana.
- (3) Itabira integrated operation includes Conceição and Minas do Meio mines.
- (4) Minas Centrais includes reserves for Brucutu, Apolo project and Morro Agudo mine.
- (5) Mariana integrated operation includes Alegria, Fábrica Nova and Fazendão mines and Capanema project.
- (6) Approximate drill hole spacing used to classify the Reserves were: 100m × 100m to Proven Reserves and 200m × 200m to Probable Reserves. Average product recovery (tonnage basis) of the iron ore reserves are: 64% for Vargem Grande and 73.9% for Paraopeba.
- (7) Vargem Grande integrated operation includes Sapocado, Galinheiro, Tamanduá, Capitão do Mato and Abóboras mines.
- (8) Paraopeba integrated operation includes João Pereira, Segredo, Mar Azul and Capão Xavier mines.
- (9) Approximate drill hole spacing used to classify the reserves were: 150m × 100m to proven reserves and 300m × 200m to probable reserves, except Serra Leste which is 100m × 100m to proven reserves and 200m × 200m to probable reserves. Average product recovery (tonnage basis) of the iron ore reserves are: 100% for Serra Norte, 100% for Serra Leste and 100% for Serra Sul.
- (10) Serra Norte integrated operation includes N3, N4W, N4E and N5 mines and N1, N2 projects.
- (11) Serra Sul integrated operation includes S11 C and S11 D deposits.

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

Iron ore integrated operations				
	Type	Operating since	Projected exhaustion date(1)	Vale interest (%)
Southeastern System				
Itabira	Open pit	1957	2029	100.0
Minas Centrais	Open pit	1994	2065	96.0
Mariana	Open pit	1976	2091	100.0
Southern System				
Vargem Grande(2)	Open pit	1942	2119	100.0
Paraopeba(2)	Open pit	2003	2073	100.0
Northern System				
Serra Norte	Open pit	1984	2047	100.0
Serra Sul	Open pit	2016	2056	100.0
Serra Leste	Open pit	2014	2054	100.0

(1) Indicates the life-of-mine for the operating mine with the longest projected exhaustion date in the complex.

(2) Reviewed as of system structure modification.

MANGANESE ORE RESERVES

The following tables set forth manganese ore reserves and other information about our mines. The variation in the mine's ore reserves from 2018 to 2019 predominantly reflects depletion through mine production. Our manganese ore reserves information for Urucum are currently being reviewed to consider new economic assumptions and ongoing geotechnical studies, which are expected to be completed by 2020. Although the Urucum mine continues to operate, we are not in a position to report reserves for the Urucum mine until the conclusion of these studies.

Manganese ore reserves(1)(2) (As of December 31, 2019)								
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Azul	9.1	26.5	4.0	27.5	13.1	26.8	14.7	26.8
Morro da Mina	4.6	28.5	3.6	24.6	8.3	26.8	8.5	26.7
Total	13.7	27.2	7.7	26.2	21.4	26.8	23.2	26.7

(1) Manganese Ore Reserve estimates stated as million metric tonnes inclusive moisture and dry %Mn grade; following moisture contents: Morro da Mina (3.4%) and Mina do Azul (18.0%).

(2) Approximate drill hole spacing used to classify the reserves was: 100m × 100m for Proven Reserves and 200m × 200m for Probable Reserves. Average product recovery (tonnage basis) of the iron ore reserves are: Azul (40%) and Morro da Mina (70%).

The mine exhaustion schedule has been adjusted to reflect our new production plan.

Manganese ore mines				
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Azul	Open pit	1985	2025	100.0
Morro da Mina	Open pit	1902	2055	100.0

COAL RESERVES

Our coal reserve estimates have been provided on an in-place material basis after adjustments for depletion through mine production, anticipated mining losses and dilution. Marketable reserves include adjustments for losses associated with beneficiation of raw coal mined to meet saleable product requirements. Our coal reserve estimate decreased by approximately 16 million metric tons after the conclusion of an extensive infill exploration program in the last 2 years, which included a drilling campaign and bidimensional seismic surveys, and consequent review of geological factors such as the presence of complex structures and a better definition of the extent of heat affected coal. Our reported reserve estimates also decreased in approximately 21 million metric tons due to the existence of an interference with local infrastructure, which we plan to reevaluate in the coming years.

We continue our brownfield exploration program in Moatize aiming to reduce geological uncertainties, improve the confidence of our mining plans and expand our reserves. The results of this campaign are still under analysis and have not been reflected in our ore reserve disclosure, they are expected for 2021.

		ROM(2)				Marketable reserves(3)	
		Proven – 2019	Probable – 2019	Total – 2019	Total – 2018	2019	2018
Coal type		Tonnage	Tonnage	Tonnage CV	Tonnage CV	Tonnage	Tonnage
Moatize	Metallurgical & thermal	194.6	719.2	913.8 26	985.7 26.0	364.9	403.0

- (1) The reserve stated above is on a 100% shareholding basis. Vale has a 80.75% ownership interest in the Moatize mine.
(2) Tonnage is stated in millions of metric tons and is reported on an *in situ* 4.0% moisture basis. Calorific Value (CV) for thermal coal is stated as the Gross Calorific Value (Mj/Kg) on air-dried basis.
(3) Tonnage is stated in millions of metric tons.

	Type	Operating since	Projected exhaustion date	Vale interest (%)
Moatize	Open pit	2011	2039	80.75

NICKEL ORE RESERVES

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

	Nickel ore reserves(1) (As of December 31, 2019)								
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018		Recovery range (%)
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	
<i>Canada</i>									
Sudbury	19.0	1.59	39.1	1.28	58.1	1.38	61.7	1.40	75 – 85
Thompson ...	–	–	–	–	–	–	–	–	85 – 90
Voisey's Bay ..	13.4	2.24	15.5	2.00	28.9	2.11	31.0	2.12	80 – 90
<i>Indonesia</i>									
PTVI	66.2	1.72	41.4	1.75	107.6	1.73	116.4	1.74	85 – 90
<i>New Caledonia</i>									
VNC	–	–	–	–	–	–	–	–	–
<i>Brazil</i>									
Onça Puma(2)	60.3	1.66	53.1	1.38	113.3	1.53	113.8	1.53	85 – 90
Total	158.9	1.73	149.1	1.52	307.9	1.63	322.9	1.64	

(1) Tonnage is stated in millions of dry metric tons. Grade is % of nickel.

(2) Estimated consolidated nickel ore reserves include 1.4 million dry metric tons of stockpile.

In Canada, our Sudbury and Voisey's Bay operation's mineral reserves decreased in 2019 due to depletion. In Indonesia, the mineral reserves at the PTVI operations decreased due to depletion and pit optimization studies. The mineral reserves at Onça Puma, in Brazil, decreased due to reclaiming stockpiles and due to the resumption of mining operations in the third quarter of 2019. (see *Overview—Business overview—Resumption of operations in Onça Puma*).

We are not reporting the mineral reserves of VNC and Thompson as of December 31, 2019, because the mineral reserves for our operations in New Caledonia and Thompson would not be economically viable at the three-year historical average price, due to the decline in nickel prices in the past three years. However, based on our expectations about future prices, our operations in New Caledonia and Thompson continue to be economically viable. VNC and Thompson continue to operate and are currently conducting studies to identify measures to reduce their costs of production.

Nickel ore mines				
	Type	Operating since	Projected exhaustion date	Vale interest (%)
<i>Canada</i>				
Sudbury	Underground	1885	2043	100.0
Thompson	Underground	1961	–	100.0
Voisey's Bay(1)	Open pit/ Underground	2005	2034	100.0
<i>Indonesia</i>				
PTVI	Open pit	1977	2044(2)	59.28
<i>New Caledonia</i>				
VNC	Open pit	2011	–	95.0
<i>Brazil</i>				
Onça Puma	Open pit	2011	2072	100.0

(1) Voisey's Bay will transition from an open pit mine to an underground mine.

(2) Extension of four years because of a re-evaluation due to a pit design update related to pit optimization results.

COPPER ORE RESERVES

Our copper mineral reserve estimates are of in-place material after adjustments for depletion and mining losses and recoveries, with no adjustments made for metal losses due to processing.

Copper ore reserves(1) (As of December 31, 2019)									
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018		Recovery range %
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	
<i>Canada</i>									
Sudbury	19.0	2.38	39.1	1.45	58.1	1.75	61.7	1.78	90 – 95
Voisey's Bay ..	13.4	0.98	15.5	0.88	28.9	0.92	31.0	0.94	90 – 95
<i>Brazil</i>									
Sossego(2)	96.6	0.69	12.6	0.52	109.3	0.67	109.0	0.66	90 – 95
Salobo(3)	316.1	0.57	832.4	0.62	1,148.4	0.60	1,156.9	0.61	80 – 90
Total	445.1	0.69	899.6	0.66	1,344.7	0.67	1,358.5	0.67	

(1) Tonnage is stated in millions of dry metric tons. Grade is % of copper.

(2) Estimated consolidated copper ore reserves include 35.7 million dry metric tons of stockpile.

(3) Estimated consolidated copper ore reserves include 163.4 million dry metric tons of stockpile.

In Canada, our Sudbury and Voisey's Bay operations' mineral reserves decreased in 2019 due to depletion. In Brazil, the Sossego operation's mineral reserves remained relatively constant with depletion offset by an increase from conversion to reserves from resources. The mineral reserve estimates at the Salobo operation decreased due to depletion, partially offset by medium and low-grade stockpile additions and conversion from resources to reserves. Furthermore, approximately 292 million metric tons of proven mineral reserves were re-categorized as probable reserves due to a drill spacing study for resource classification.

Copper ore mines				
	Type	Operating since	Projected exhaustion date	Vale interest (%)
<i>Canada</i>				
Sudbury	Underground	1885	2043	100.0
Voisey's Bay	Open pit/Underground	2005	2034	100.0
<i>Brazil</i>				
Sossego	Open pit	2004	2028	100.0
Salobo	Open pit	2012	2052	100.0

PGMS AND OTHER PRECIOUS METALS RESERVES

We expect to recover significant quantities of precious metals as byproducts of our Sudbury, Sossego and Salobo operations. Our mineral reserve estimates are of in-place material after adjustments for depletion and mining losses and recoveries, with no adjustments made for metal losses due to processing.

Precious metals reserves(1) (As of December 31, 2019)									
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018		Recovery range (%)
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	
<i>Canada</i>									
<i>Sudbury</i>									
Platinum ...	19.0	1.37	39.1	1.20	58.1	1.26	61.7	1.2	80 – 90
Palladium ..	19.0	1.55	39.1	1.50	58.1	1.52	61.7	1.5	80 – 90
Gold	19.0	0.56	39.1	0.43	58.1	0.47	61.7	0.5	80 – 90
<i>Brazil</i>									
<i>Sossego</i>									
Gold(2)	96.6	0.19	12.6	0.14	109.3	0.18	109.0	0.2	75 – 80
<i>Salobo</i>									
Gold(3)	316.1	0.30	832.4	0.32	1,148.4	0.32	1,156.9	0.3	60 – 70
Total Pt + Pd(4).	19.0	2.92	39.1	2.70	58.1	2.77	61.7	2.8	
Total Gold	431.7	0.29	884.1	0.32	1,315.8	0.31	1,327.6	0.3	

(1) Tonnage is stated in millions of dry metric tons. Grade is grams per dry metric ton.

(2) Estimated consolidated copper ore reserves include 35.7 million dry metric tons of stockpile.

(3) Estimated consolidated copper ore reserves include 163.4 million dry metric tons of stockpile.

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

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

Precious metals mines				
	Type	Operating since	Projected exhaustion date	Vale interest (%)
<i>Canada</i>				
Sudbury	Underground	1885	2043	100.0
<i>Brazil</i>				
Sossego	Open pit	2004	2028	100.0
Salobo	Open pit	2012	2052	100.0

COBALT ORE RESERVES

We expect to recover significant quantities of cobalt as a byproduct of our Sudbury and Voisey's Bay operations. Our cobalt reserve estimates are of in-place material after adjustments for depletion and mining losses, with no adjustments for metal losses due to processing.

	Cobalt ore reserves(1) (As of December 31, 2019)								
	Proven – 2019		Probable – 2019		Total – 2019		Total – 2018		Recovery range %
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	
<i>Canada</i>									
Sudbury	19.0	0.04	39.1	0.04	58.1	0.04	61.7	0.03	20 – 40
Voisey's Bay ..	13.4	0.13	15.5	0.12	28.9	0.13	31.0	0.13	70 – 80
<i>New Caledonia</i>									
VNC	–	–	–	–	–	–	–	–	–
Total	32.4	0.08	54.6	0.06	87.0	0.07	92.7	0.06	

(1) Tonnage is stated in millions of metric tons. Grade is % of cobalt.

Our cobalt reserve estimates decreased in 2019 for the same reasons discussed above in connection with the nickel mineral reserves.

	Cobalt ore mines			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
<i>Canada</i>				
Sudbury	Underground	1885	2043	100.0
Voisey's Bay	Open pit/ Underground	2005	2034	100.0
<i>New Caledonia</i>				
VNC	Open pit	2011	–	95.0

CAPITAL EXPENDITURES

Our investment budget for capital expenditures in 2020 is approximately US\$5 billion, including approximately US\$4.1 billion to sustaining our existing operations and replacement projects and approximately US\$900 million for project execution, reflecting a 35% increase compared to 2019. Most of the capital expenditures budget for project execution will be invested in Brazil (93%).

	2020 budget		2019 expenditures(1)	2018 expenditures(1)
	(US\$ million)	(% of total)	(US\$ million)	
Project execution (construction in progress)	900	18.0%	544	888
Investments to sustain existing operations and replacement projects (property, plant and equipment)	4,100	82.0%	3,160	2,896
Total	US\$ 5,000	100%	3,704	US\$ 3,784

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

Our project portfolio is comprised of few projects, largely under development, focused on organic growth and with expectations of high rates of return. Our two main initiatives, the Salobo III project and the Northern System 240Mt Program, account for 61% of the US\$900 million budget for project execution in 2020. With respect to replacement projects, the VBME and the Gelado projects account for 15% of the US\$ 4.1 billion budget for sustaining existing operations and replacement projects.

The following table sets forth total expenditures in 2019 for our main investment projects and expenditures budgeted for those projects in 2020, together with estimated total expenditures for each project and the actual or estimated start-up date of each project as of December 31, 2019.

Business area	Main projects(1)	Actual or estimated start-up	Executed CAPEX		Expected CAPEX	
			2019(2)	Total executed(3)	2020(4)	Total expected(5)
				(US\$ million)		
Iron ore	CLN S11D	2H19(6)	179	7,333	147	7,679
Base Metals—North Atlantic	VBME	1H21	249	471	499	1,694
Iron ore	Gelado	2H21	70	75	121	428
Base Metals—South Atlantic	Salobo III	1H22	133	136	323	1,128
Iron ore	Northern System 240 Mt Program	2H22	69	69	224	772

(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, 2019, including capital expenditures in prior periods.

(4) Figure presented corresponds to the investment budget for capital expenditures in 2020 of approximately US\$5 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.

(6) The CLN S11D project had physical completion in December 2019. Until 2022, the project will be in a monitored ramp-up phase with additional works expected on adjustments.

Our key investment projects are described in more detail below:

- The CLN S11D project was launched in 2014 to increase the logistics capacity of the Northern System to support the S11D mine, including the expansion of approximately 570 km of railway, construction of a railway spur of 101 km, acquisition of wagons and locomotives and port expansion (onshore and offshore expansions at Ponta da Madeira maritime terminal). The project had physical project completion and start up in December 2019, with executed

capital expenditures (total cash outflows) of US\$7.333 billion. Until 2022, the project will be in a monitored ramp-up phase with additional works expected on adjustments.

- The Voisey's Bay underground mine extension project ("VBME") 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 mine production, thus being recorded as a sustaining investment for the purpose of the dividend policy. The project is 41% complete, with executed capital expenditures (total cash outflows) of US\$471 million. Start-up is expected in the first half of 2021. In June 2018, we announced a cobalt streaming transaction that enabled the development of VBME.
- The Gelado project, approved in September 2018 by our Board of Directors, will 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 2019, the project reached a physical progress of 48%, with executed capital expenditures (total cash outflows) of US\$75 million. In 2020, additional civil and earthworks will be completed, while equipment will have installation started. Start-up is expected for the second half of 2021.
- The Salobo III copper project, approved in October 2018 by our Board of Directors, is a brownfield expansion of our Salobo operations, increasing processing throughput 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 50 ktpy in the first 5 years, 42 ktpy in the first 10 years and 36 ktpy throughout the life of mine. Start-up is scheduled for the first half of 2022 with a ramp up of 15 months. In 2019, 40% of the project's physical progress was completed, with the partial conclusion of earthworks and ground preparation, and conclusion of construction of gearless engines and part of the heavy structures by international providers. In 2020, additional civil and earthworks will be completed, while machinery arrival and assembling are expected at the site.
- The Northern System 240 Mt Program, approved in December 2018 by our Board of Directors, will expand the iron ore fines production and logistics capacity at our Northern System until the end of 2022, when the total annual capacity is expected to reach 240 million tons. In 2019, the project's physical progress reached 14%, with the partial completion of earthworks, the replacement of crushers, advances in the assembling of the Line 3 of the railway's reverse loop and the issuance of the installation permit for both mine and plant, among other measures. In 2020, additional civil and earthworks are expected, as well as further assembling of stretches of the railway grid and the retaining of long-distance conveyor belt.

REGULATORY MATTERS

We are subject to a wide range of governmental regulation 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 State 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 principal concessions and other similar rights for our continuing operations.

Location	Mining title	Approximate area covered (in hectares)	Expiration date
<i>Brazil</i> (1).....	Mining concessions (including under applications)	597,877	Indefinite
<i>Canada</i> (2).....	Mining concessions (terminology varies among provinces)	218,761	2020 – 2040
<i>Indonesia</i> (3).....	Contract of work	118,017	2025
<i>New Caledonia</i> (4).....	Mining concessions	21,077	2022 – 2051
<i>Mozambique</i> (5).....	Mining concessions	23,780	2032

- (1) Does not include 3,314 hectares of mining concessions held by Ferrous Resources do Brasil S/A, company in the process of incorporation by Vale.
- (2) The approval process for applications submitted in 2020 is in progress. All conditions required for the renewal were fulfilled. This process usually takes a number of years and we can continue to operate while the approval process is ongoing.
- (3) The contract of work entered into by PTVI and the Indonesian government will expire in 2025. PTVI is entitled to two 10-year extensions in the form of a business license, subject to government approval.
- (4) VNC has requested renewal of some concessions that were scheduled to expire before 2019. We may continue to operate while the approval process is ongoing.
- (5) Entitled to 25-year extensions, subject to approval by the Mozambique government.

In addition to the concessions listed above, we have exploration licenses and exploration applications covering 3.50 million hectares in Brazil and 1.05 million hectares in other countries.

There are several proposed or recently adopted changes in mining legislation and regulations in the jurisdictions where we have operations that could materially affect us. In 2019, there were several developments to the Brazilian legislative and regulatory framework concerning the operation of dams, including but not limited to the prohibition of the construction, maintenance or raising of dams by the upstream raising method throughout Brazil and the obligation to take out insurance and/or provide financial guarantees to support recovery, compensatory indemnities and other expenditures related to eventual accidents or the mining closure process.

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, net of taxes, insurance costs and costs of transportation. 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 and contributions; (ii) for exports, the basis for calculation of CFEM is 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 the ANM. The current CFEM rates are: 3.5% for iron ore; 2% for copper, nickel and other materials; 3% for bauxite and manganese ore; and 1.5% for gold.
- *Brazilian states.* Several Brazilian states, including Minas Gerais, Pará and Mato Grosso do Sul, impose a tax on mineral production (*Taxa de Fiscalização de Recursos Minerais—TFRM*), which is assessed at rates ranging from R\$0.50 to R\$3.575 per metric ton of minerals produced in or transferred from the state.
- *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.
- *Mozambique.* The mining agreement signed in June 2007 with the Mozambican government requires that we pay a royalty known as IPM (*Imposto sobre a Produção Mineira*) on revenues from sales of extracted coal, net of insurance and transportation costs incurred before sales. The royalty rate on coal mining activity in Mozambique is currently 3%.
- *Indonesia.* Our subsidiary 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.
- *New Caledonia.* The mining code of New Caledonia requires us to pay royalties linked to the ownership of mining concessions. The basis of calculation is (i) 800 Pacific francs per hectare when the owned surface is less than 15,000 hectares and (ii) 1,000 Pacific francs per hectare when the owned surface is greater than 15,000 hectares.

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.

We are taking several steps to improve the efficiency of the licensing process, including stronger integration of our environmental and project development teams, funding research into new and alternative technologies to reduce environmental and social impacts, use and continuous improvement of a Best Practices Guide for Environmental Licensing and the Environment, the deployment of highly-skilled specialist teams, identification and mitigation of principal risks and closer interaction with environmental regulators.

Environmental regulations affecting our operations relate, among other matters, to emissions of pollutants into the air, soil and water, including greenhouse gas 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; and financial provisions and closure plans required for mining licenses, including decharacterization, decommissioning, environmental liabilities and reclamation and remediation costs. Environmental legislation is becoming stricter worldwide, which could lead to greater costs for environmental compliance. In particular, we expect heightened attention from various governments to reducing greenhouse gas emissions as a result of concern over climate change, especially following the entry into force of the Paris Agreement in late 2016.

There are several examples of environmental regulation and compliance initiatives that could affect our operations. For instance, under applicable Brazilian regulations for the protection of caves, we are required to conduct extensive technical studies and negotiate compensatory measures with Brazilian environmental regulators in order to continue to operate in certain sites. In certain of our iron ore mining operations or projects, we may be required to limit or modify our mining plans or to incur additional costs to preserve caves or to compensate for the impact on them, with potential consequences for production volumes, costs or reserves in our iron ore business. Also, a Brazilian regulation for the protection of indigenous people, which was enacted in 2011 and revised in 2015, requires us to conduct specific studies of impact and sponsor mitigation programs in connection with operations and projects close to indigenous people's lands. There are also environmental regulatory obligations that could affect our operations or lead to compensatory measures related to native vegetation suppression in the state of Minas Gerais, the Atlantic Forest biome, flora species protected by law and permanent preservation areas. In 2018, the federal government created new rules for the payment of environmental compensation for activities subjected to environmental assessment. As a result, in 2018 and 2019 we recognized a liability related to regulatory obligations stemming from the new rules.

BRAZILIAN REGULATION OF MINING DAMS

In May 2017, the DNPM (predecessor to the ANM) created new obligations for companies operating mining dams in Brazil, primarily:

- *Audit:* Companies operating mining dams must conduct two annual stability audits for each dam and prepare a stability condition report and the corresponding Stability Condition Statement (DCE). One of these audits must be conducted by external auditors.
- *Dam Periodic Safety Reviews (RPSB—Revisão Periódica de Segurança de Barragem):* 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 rupture impact studies. The RPSB reports must be renewed each 3, 5 and 7 years for high, medium and low DPA respectively, and whenever any structural modifications are made.
- *Emergency Action Plan of Mining Dams Training:* Companies operating high-DPA mining dams must conduct two annual emergency action plan training sessions for their employees.

In February 2019, the ANM issued a resolution on dam safety requiring companies that own upstream dams to submit a technical decharacterization project and to fully decharacterize 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 Dam Stability Condition Statement 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. This resolution was updated in August 2019 and further adjustments are expected for 2020.

In February 2019, a statute approved by the state of Minas Gerais prohibits the increase, modification or 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 general, it imposes certain restrictions on the use of any other type of tailings dams and significant restrictions on our ability to increase any existing dam.

REGULATION OF OTHER ACTIVITIES

In addition to mining and environmental regulation, 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 and safety, 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 Infrastructure and the regulatory agency for ground transportation (ANTT). The concessions for EFC and EFVM expire in 2027 and both may be renewed for 30 years at the federal government's discretion. VLI 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. FCA and MRS concessions expire in 2026 and they 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 approved 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. In 2016, we and other railroad concessionaires in Brazil initiated discussions with ANTT regarding the possibility of early renewal of railway concession agreements, which are ongoing. Approval would require a formal analysis of the economic and technical conditions by the federal government, federal court of auditors (TCU) and the approval of our Board of Directors. As part of the process, in 2019, both ANTT and the Brazilian Ministry of Infrastructure (MINFRA) concluded their technical analysis regarding EFC and EFVM and submitted to the federal court of auditors (TCU) the recommendation that both concession contracts be extended until 2057. TCU has asked ANTT, MINFRA and us to complement and clarify the technical analyses regarding the railroads. If we agree to an earlier renewal of our concessions, we may have to agree with additional performance indicators, new investments obligations and new service standards.
- *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 Infrastructure through the National Secretariat of Ports and Aquatic Transport

(SNP), 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 agreement with CPBS, which will expire in 2026 and may be renewed for one more period at the discretion of the Ministry of Infrastructure and the federal regulatory agency.

- *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 REACH regulations. In addition, South Korea is currently implementing a regulation similar to 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, coal, 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. The organization will reach a final strategy, including the measures to be adopted, by 2023. These measures may increase our freight cost in the future. In 2016, the IMO also approved regulation establishing limits for sulfur oxides emission limits, which will become 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. Also, the International Convention for the Control and Management of Ships’ Ballast Water and Sediments became effective in September 2017 for new ships (those with keels laid after that date). For existing ships, the convention will become effective in stages beginning in September 2019, following which date each vessel will have a specific deadline for compliance, with the global fleet required to be fully compliant by September 2024. Under this convention, all compliant ships during their international voyages are required to manage their ballast water and sediments in accordance with the defined requirements, which may also result in increases of freight and port operation costs.

III. OPERATING AND FINANCIAL REVIEW AND PROSPECTS

OVERVIEW

The rupture of Dam I and its consequences had extensive impact on our financial performance and results of operations for the year of 2019. For a discussion of the impact of the dam rupture on our results, see *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine*.

In 2019, we recorded a loss attributable to our stockholders of US\$1.683 billion, compared to net income of US\$6.860 billion in 2018. This loss was mainly driven by: (i) provisions of US\$7.402 billion for emergency actions, reparation and remediation measures associated with the rupture of Dam I, including the plan for decharacterization of our other upstream dams, (ii) impairment charges of US\$4.202 billion on our nickel assets in New Caledonia and coal mine assets in Mozambique, and (iii) additional provisions for the Renova Foundation and the decharacterization of Samarco's Germano dam, in the total amount of US\$758 million. These factors were partially offset by (iv) a US\$2.555 billion decrease in foreign exchange losses in 2019, compared to 2018. Expenses associated with the rupture of Dam I also affected our Adjusted EBITDA, which decreased to US\$10.585 billion in 2019 from US\$16.590 billion in 2018. This decrease was partially offset by higher iron ore sales prices (with an impact of US\$5.445 billion in our Adjusted EBITDA), mainly due to the increase in the average realized price for iron ore in 2019 (a 31.6% increase compared to the average realized price in 2018). Adjusted EBITDA is a non-GAAP measure, which is calculated using net income or loss and adding (i) depreciation, depletion and amortization, (ii) income taxes, (iii) financial results, net, (iv) equity results and other results in associates and joint ventures, (v) impairment and disposal of non-current assets, and (vi) dividends received and interest from associates and joint ventures. 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—Adjusted EBITDA by segment*.

COVID-19

The COVID-19 pandemic is having a significant impact on the global economy and financial markets. At this time, the outbreak has not caused a significant impact to our operations, logistics or sales, but if it continues for an extended period of time, our financial conditions or results of operations in 2020 may be adversely impacted. Below is a summary of the key impacts on our business and the risks we are facing in 2020:

- We have ramped down our Voisey's Bay mining operation and placed it on care and maintenance for a period of four weeks, which is expected to have a moderate impact on our revenues and increase in our expenses for base metals. We have also suspended our Teluk Rubiah Maritime Terminal in Malaysia, which is expected to cause a marginal cost increase due to additional logistics.
- Steel production cuts in Europe are expected to adversely impact iron ore demand, while iron ore supply cuts due to lockdowns could soften the impact.
- If we are required to suspend additional operations, or if we suffer restrictions on our ability to transport our products to customers generally, our results for 2020 may be impacted by reduced revenues and increased logistics costs and stoppage expenses. This may also adversely affect our cash generation and liquidity in 2020.
- Business activities all over the world, including construction and manufacturing activities that drive demand for iron ore and other metals, have started to decline. If this decline

continues for an extended period of time, particularly in China, our revenues and cash generation are expected to be adversely impacted.

- Abnormally large changes have occurred in the valuation of financial assets across many markets since December 31, 2019, which may impact the fair values of our assets and liabilities.
- We have suspended all non-essential construction works at our sites, which may increase our expenses, and delay the achievement of the benefits of our expansion plans, revision of operations or resumption of production capacity, among other difficulties.
- Our supply chain may be significantly impacted by COVID-19, which may result in suspension of operations, operation difficulties, and increases in costs and expenses. We are helping our small and medium-sized suppliers, with payment advances, reduction in payment terms and payroll support, which will cause a moderate increase in our costs and expenses.
- Deterioration of our customers' financial health may result in decreased demand for our products, payment defaults and price decreases, which may adversely impact our revenues and cash generation.

For more information on the risks related to the COVID-19 pandemic and our response see *Overview—Business overview—Significant changes in our business—Developments relating to the outbreak of the coronavirus* and *Overview—Risk factors—Developments relating to the outbreak of the coronavirus may have a material adverse impact on our financial conditions or results of operations*.

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 and infrastructure construction and global industrial production. Demand from China has been the principal driver of world demand and prices.

In 2019, an iron ore supply shortage from main suppliers, driven by disruptions on supply side and attributable mainly to the Brumadinho event in Brazil and to the impact of cyclone Veronica in Australia, heavily impacted global seaborne supply. During the year, iron ore price levels were mainly sustained by these constraints, combined with firm steel consumption in China. Chinese steel mills increased their productivity in response to the increase in demand, which supported price growth for all iron ore grades. Steel production cuts in Europe are expected to adversely impact iron ore demand, while iron ore supply cuts due to lockdowns could soften the impact.

China's steel sector outperformed expectations in 2019, mainly driven by real estate, machinery, and home appliance sectors. The real estate sector outperformed expectations during the year due to strong levels of construction starts. The infrastructure sector underperformed during the year, mainly driven by

continued controls on shadow credit. Manufactured goods demand was tepid as external demand slowed due to continued uncertainty in trade and internal demand weakened mainly driven by lower consumption of automobiles. Strong construction demand has led China to deliver a record high steel production of 996 Mt in 2019, an increase of 8.3% year on year as per the World Steel Association.

Global steel production, excluding China, was weak in 2019 with an output of 882 Mt, a decrease of 0.3% year-on-year, as the steel sector was affected by trade war tensions, political uncertainties, such as Brexit, and growing tensions in the Middle East, all of which impacted global trade and manufacturing of consumer and capital goods, and blocked investments from materializing.

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, should support the demand for high-quality ores that enable productivity and lower emission levels like pellets and IOCJ.

Iron ore Platts IODEX 62% averaged US\$93.4/dmt in 2019, a significant increase the 2018 level of US\$69.5/dmt, as the gap between iron ore supply and demand widened and led to higher iron ore prices and premiums across the world.

We expect that iron ore prices will be subject to additional volatility in 2020 due to the impact of the COVID-19 pandemic.

Nickel

Nickel is an exchange-traded metal, listed on the LME and, starting in 2015, on the SHFE. Most nickel products are priced based on a discount or premium to the LME price, depending on the nickel product's physical and technical characteristics. Demand for nickel is strongly affected by stainless steel production, which represents 68% of global primary nickel consumption in 2019.

We have short-term fixed-volume contracts with customers for the majority of our expected annual nickel sales. These contracts, together with our sales for non-stainless steel applications (alloy steels, high nickel alloys, plating and batteries), provide stable demand for a significant portion of our annual production. In 2019, 70% of our refined nickel sales were made for non-stainless steel applications, compared to the industry average for primary nickel producers of 32%, bringing more 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 2019, stainless steel production in China represented 65% of total nickel demand. As a consequence, changes in Chinese stainless steel production have a large impact on global nickel demand. In 2019, Chinese stainless steel production grew 11% compared to 2% in 2018. Also, the growth in stainless steel focused on 300-series grade steels, which contains relatively high amounts of nickel, due to superior physical characteristics compared to other austenitic stainless steel series.

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 2015 and 2019, secondary nickel accounted for approximately 40% 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 represents 21% of the total nickel used for stainless steel, while nickel pig iron,

a relatively low grade nickel product made primarily in China from imported lateritic ores, accounts for approximately 37%.

In recent years, Chinese domestic production of nickel pig iron accounted for the majority of world nickel supply growth. In 2019, approximately 570kt, representing 24% of world primary nickel supply was produced as nickel pig iron in China using nickel ore from the Philippines and Indonesia. Chinese nickel pig iron production was adversely affected by export restriction of unprocessed ores from Indonesia, beginning in 2014. In January 2017, the Indonesian government issued a ministerial decree changing the 2009 mining law that banned the export of unprocessed and semi-processed ores from the country. The ministerial decree allows for the controlled recommencement of limited nickel ore exports from Indonesia allowing availability of ores for the production of nickel pig iron in China, with the expectation of re-enforcing the export ban in 2022. As a result, the bottleneck for production has shifted away from ore availability to nickel pig iron capacity. In 2019, the Indonesian government advanced the export ore ban from the beginning of 2022 to the beginning of 2020. These dynamics have allowed Indonesia to emerge as a large producer of nickel pig iron. In 2019, 383kt of nickel as nickel pig iron was produced in Indonesia much of it integrated directly to produce stainless steel. We expect nickel pig iron production in Indonesia to continue to grow, while China's nickel pig iron production to be impacted by the Indonesian ore export ban advancement.

In addition, the high-value segment, which consists of both Upper Class and Lower Class I products, is the second largest market, making up 26% of nickel demand in 2019. Global high-value markets declined slightly by 1% compared to a growth of 1% in 2018, with China (the largest consumer in the high-value market, representing 28% of the market in 2019) leading the contraction with a 3% decline compared to 2018 demand.

The nickel market was in deficit in 2019 by approximately 23kt. Global exchange inventories (London Metals Exchange and Shanghai Future Exchange) declined 28,418 metric tons from January 1, 2019 to December 31, 2019, implying some off-exchange inventory holding. For 2020, due to recent events, mostly related to the COVID-19, we expect the market to be in surplus.

In the long term, the battery segment shows important upside potential as electric vehicle production continues to attract significant investments, which could positively affect nickel price and our nickel premiums. As currently foreseeable, commercially viable electric vehicle battery technologies utilize nickel; increasing nickel content in such batteries results in improved energy storage and lower cost. As a result, nickel demand is expected to surge, 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 and lower cost.

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 LME, SHFE and 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 was relatively flat in 2019, with China responsible for approximately 51% of worldwide consumption. Predominant use of copper was in construction and in the electrical grid. Supply disruptions due to labor negotiations and mine closures in 2019 resulted in mine production growth being relatively flat compared to 2018. In the first half of the year, a positive macroeconomic environment helped improve copper prices. Yet, this trend reversed during the second half of the year where trade war

disputes between China and the United States were exacerbated, placing downward pressure on copper prices. For 2020, we anticipate that the market will be in surplus; however, relatively small given the market size and due to recent events, mostly related to the COVID-19.

Coal

Demand for metallurgical coal is fundamentally driven by steel demand, and future growth continues to be expected in Asia. Asia, including India, accounts for more than 70% of the steel market and consumes approximately 75% of seaborne metallurgical coal. Chinese total coking coal imports increased by 14% to almost 73 million metric tons in 2019 compared to approximately 64 million metric tons imported in 2018, mainly due to increased pig iron production. Global demand, excluding China, has reduced by approximately 1% in 2019, compared to 2018, mainly driven by BF production cuts in Europe and JKT.

In the international market, price volatility continued in 2019. Premium coking coal average price reduced by 14.5% year-on-year from US\$207 per metric ton in 2018 to US\$177 per metric ton in 2019. Seaborne coking coal prices were strong at US\$200 per metric and higher in early January amid severe weather conditions and logistics constraints. Prices remained above US\$200 per metric ton in 1H19 driven by strong crude steel production in China, India and stable production across other regions. However, prices started to decline since the beginning of the second half of 2019, mainly due to a rise in supply from Australia over the closure of the financial year, reduced steel production in India over monsoons, weak infrastructure, macro-economic conditions, automobile consumption, BF production cuts in Europe with a rise in prices for steel making raw materials and carbon reducing steel margins. The prices dropped to as low as US\$133 per metric ton. The price of metallurgical coal on January 10, 2020 was US\$152.50 per metric ton.

Demand for thermal coal is closely related to electricity consumption, which continues to be driven by global economic growth and urbanization, with the highest levels of growth found in Asia and emerging markets. The Chinese seaborne thermal coal import posted a third year in a row increase, reaching approximately 226 million metric tons in 2019, up 4.3% year on year, as a result of a slight rise in power demand, reduced domestic coal over safety inspections and price arbitrage against seaborne coal. Demand in Asian countries (excluding China) has been on the rise with Vietnam almost doubling imports from 23 million metric tons in 2018 to 45 million metric tons in 2019. Coal consumption for power generation has fallen for the fifth consecutive year in Europe, and demand is estimated to drop by more than 12% year-on-year. The European seaborne import decrease was largely impacted by the decline in coal consumption in the UK and Germany, and continued competition against gas and renewables. In India, year-on-year thermal coal demand remained firm, and seaborne imports increased by approximately 9% in 2019, compared to 2018, due to increased power generation and lower than expected domestic production. The power sector in India is expected to grow in the near term and domestic production plans set by the Indian government are unlikely to reach targets due to a number of land acquisition issues and infrastructure projects.

The Newcastle Index average in 2019 reached US\$77.50 per metric ton, a decrease by 28% year on year, while the Richards Bay Coal Index decreased by 27% to US\$71.50 per metric ton. Thermal coal prices started the year strong, supported by healthy demand in India, but gradually declined throughout the year due to reduced coal demand resulting from warm winters in Europe and China, cheaper natural gas and high renewables in Europe, a rise in nuclear generation in Japan and Korea and weak demand from the Indian cement and sponge iron sector. The drop in benchmark prices saw discounts of off-specification coal return to historical average levels of US\$7 to US\$10 per metric ton in Richards Bay.

Climate change policies may continue to adversely impact coal demand in Europe, North America and China. However, consumption in other developing Asian economies such as Southeast Asia and South Asia

is expected to expand. On the supply side, current investments are low and the lack of new project development is expected to keep supply at current levels. Weather (warm winters, rains, summer temperatures) and alternative energy (natural gas and renewables) should play a prominent role on coal demand and prices during 2020.

RUPTURE OF DAM I

The rupture of Dam I had an extensive impact on our financial performance and results of operations as of and for the year ended December 31, 2019. The key impacts are summarized below:

- *Impact on our statement of income.* The impact of the rupture of Dam I in our income statement for the year ended December 31, 2019 was US\$7.402 billion, including expenses and provisions to meet our obligations in connection with the decharacterization of our upstream dams and the obligations we assumed in preliminary settlement agreements in connection with: (i) indemnification payments and donations to those affected by the dam rupture, (ii) remediation measures for the affected areas, and (iii) compensation to affected communities. This includes: (i) US\$3.925 billion related to preliminary settlement agreements with authorities for compensation to affected persons and communities, donations and projects to restore the environment, (ii) a US\$2.625 billion provision for the decharacterization of our upstream dams, and (iii) US\$730 million in expenses with items such as communication services, accommodation and humanitarian assistance, equipment for rescue and remediation efforts, legal services, water, food aid, and taxes, among others. Additional provisions related to the rupture of Dam I may be recognized in the future.
- *Associates and joint ventures upstream dams.* Some of our investees also operate similar upstream structures. We recognized a provision of US\$257 million in “equity results and other results in associates and joint ventures” for the decharacterization of the Germano tailings dam owned by Samarco Mineração S.A.
- *Write-down and write-off of assets.* Following the rupture of Dam I and our decision to accelerate the decharacterization of our upstream dams, we recognized a loss of US\$235 million in the “impairment and disposal of non-current assets” line of our statement of income for the year ended December 31, 2019. This is attributable to the write-off of the Córrego do Feijão mine and other upstream dams. Additional write-downs and write-offs of assets may be recognized in the future.
- *Operational stoppages.* We have suspended some of our operations and others have been suspended by judicial or administrative decisions. We are working on legal and technical measures, as applicable, to resume these operations. This affected our volume of sales of iron ore and iron ore pellets, which decreased by 12.8% and 23.7%, respectively, in the year ended December 31, 2019, compared to 2018. We recorded a loss of US\$759 million related to operational stoppages and idle capacity related to the ferrous minerals segment within “Pre-operating and operational stoppage” in our statement of income for the year ended December 31, 2019.
- *Freeze orders.* Following the rupture of Dam I, various Brazilian courts have ordered freezes, attachments, judicial deposits and similar measures affecting our financial assets, including balances in our bank accounts and pre-existing judicial deposits to secure the payment of damages resulting from the dam rupture. As of December 31, 2019, US\$1.608 billion of our assets remained restricted, of which US\$125 million consisted of cash in our bank accounts and US\$1.483 billion were converted into judicial deposits. We have obtained bank

guarantees and surety bonds in the amount of US\$1.396 billion, and have applied to the relevant courts to have part of our judicial deposits replaced with these guarantees.

RUPTURE OF SAMARCO'S FUNDÃO TAILINGS DAM

We own a 50% interest in Samarco and account for it under the equity method. Below is a summary of the impact of the rupture 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, 2019 is US\$ 1,700 million, 52% higher than in 2018, mainly due to the increase of the estimated costs driven by the revision of the plan to mitigate and compensate for the impacts of the disruption from Samarco's tailing dam, net of the contributions made to Fundação Renova. 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 2019, we contributed R\$1,655 million (US\$ 417 million), which was allocated as follows: (i) R\$1,253 million (US\$315 million) contributed to Fundação Renova and Samarco to be used in the reparation programs in accordance with the Framework Agreement, and deducted from the provision, and (ii) R\$400 million (US\$102 million) was used by Samarco to fund its working capital. These contributions were made through the issuance by Samarco of non-convertible private debentures, which were equally subscribed by Vale and BHPB. We recognized an impairment in our statement of income for the year ended December 31, 2019 for the amount of these non-convertible private debentures.
- We intend to make available short-term facilities up to US\$267 million to support Samarco's operations during 2020, and for expenses related to the experts named pursuant to the preliminary agreements with the MPF, signed in January 2017. These funds will be released as needed, but we have not undertaken an obligation to Samarco. BHPB has stated that it will make available to Samarco short-term facilities with similar terms and conditions.
- Upon creation of Fundação Renova, Samarco transferred to Fundação Renova most of the reparation and compensation programs. Therefore, we made contributions directly to Fundação Renova in the total amounts of R\$941 million (US\$294 million), R\$1,065 million (US\$290 million) and R\$1,253 million (US\$315 million) in 2017, 2018 and 2019, respectively, and we expect to contribute R\$2,079 million (US\$516 million) in 2020, to be used in the programs in accordance with the Framework Agreement.

EFFECT OF CURRENCY EXCHANGE VARIATION

Our results are affected in several ways by changes in the value of the Brazilian *real*. Year-end exchange rate variations impact our financial results, while the average exchange rate impacts our operational performance.

In 2019, the Brazilian *real* depreciated 4% against the U.S. dollar, from an exchange rate of R\$3.87 to US\$1.00 on December 31, 2018 to R\$4.03 to US\$1.00 on December 31, 2019. The most important effects were non-cash gains, as described below.

- We had *real*-denominated debt of US\$2,415 million as of December 31, 2019, excluding accrued charges. Since most of our revenues are in U.S. dollars, we used swaps 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 depreciation of the Brazilian *real* against the U.S. dollar in 2019, we had fair value gains on our currency derivatives of US\$42 million. For more information on our use of derivatives, see *Operating and Financial Review and Prospects—Risk management*.

In 2019, the annual average exchange rate for Brazilian *reais* against the U.S. dollar depreciated by 7.9%, from an average exchange rate of R\$3.66 to US\$1.00 in 2018 to R\$3.95 to US\$1.00 in 2019. This had a positive 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 (48.8% in 2019), the Brazilian *real* (44.2% in 2019), the Canadian dollar (5.9% in 2019) and the Euro (1% in 2019). As a result, the depreciation of the Brazilian *real* and other currencies against the U.S. dollar decreased our costs and expenses by US\$571 million.

Under our hedge accounting program, our debt denominated in U.S. dollars and Euros serves as a hedge instrument for our investments in Vale International. With the program, the impact of exchange rate variations on debt denominated in U.S. dollars and Euros has been partially recorded under other comprehensive income, reducing the volatility of our financial performance.

Since January 1, 2019, we have considered certain long-term intercompany loans payable by Vale S.A. to Vale International, for which settlement is neither planned nor likely to occur in the foreseeable future, as part of Vale S.A.'s net investment in foreign operation. This accounting change does not affect the tax criteria applicable to exchange variation. Until December 31, 2018, the impact of the exchange variation on these intercompany loans was reflected on our consolidated income statement. With the change in the accounting treatment, the foreign exchange differences associated with our net investment in Vale International are recognized in other comprehensive income in in our stockholders' equity. This amount would be reclassified from stockholders' equity to income statement in case of disposal or partial disposal of the net investment in Vale International. In 2019, we recognized a loss of US\$483 million (US\$319 million, net of taxes), in the "Cumulative translation adjustments" in stockholders' equity.

CHANGES IN ACCOUNTING POLICIES

Certain new accounting standards became effective for the accounting periods beginning on or after January 1, 2019. The key changes to accounting policies are described below:

- IFRIC 23—Uncertainty over income tax treatments ("IFRIC 23") became effective for annual periods beginning on or after January 1, 2019. This interpretation clarifies the measurement and recognition requirements of IAS 12 Income taxes. It does not apply to taxes or levies outside the scope of IAS 12, nor does it specifically include requirements relating to interest and penalties associated with uncertain tax treatments. The Interpretation specifically addresses the following: (i) whether an entity considers uncertain tax treatments separately, (ii) the assumptions an entity makes about the examination of tax treatments by tax authorities, and (iii) how an entity determines taxable profit (tax loss), tax bases, unused tax losses, unused tax credits, and tax rates.

We apply significant judgement in identifying uncertainties over income tax treatments, which could impact our consolidated financial statements. We operate in multiple jurisdictions where uncertainties arise in the application of complex tax regulations. We and our subsidiaries are subject to reviews of income tax filings and other tax payments, and disputes can arise with the taxing authorities over the interpretation of the applicable laws and regulations

Upon the adoption of this interpretation, we considered whether we have any uncertain tax positions, particularly those relating to the deduction of social security contributions on the net income (“CSLL”) in Brazil, and determined that, although there is an uncertainty that could affect the 2018 year end, it is deemed probable that our treatments will be accepted by the Brazilian tax authority. We did not identify any other uncertain tax positions that could result in a liability material to us.

- IFRS 16—Leases (“IFRS 16”) became effective for annual periods beginning on or after January 1, 2019 using the retrospective approach with the cumulative effect recognized as at the date of initial application. Accordingly, the comparative information has not been restated and continues to be presented under IAS 17 and related interpretations. On transitioning to IFRS 16, the lease agreements were recognized in the statement of financial position and measured discounting the remaining minimum contractual payments at the present value, using our incremental borrowing rate, depending on the remaining lease term.

We used the following practical expedients in applying IFRS 16: (i) applied a single discount rate to a portfolio of leases with similar characteristics; (ii) applied the exemption not to recognize right-of-use assets and liabilities for leases with less than 12 months of lease term and/or leases of low-value assets. The payments associated to these leases will be recognized as an expense on a straight-line basis over the lease term; and (iii) used hindsight when determining the lease term, to determine if the contract contains options to extend or terminate the lease.

As a result of IFRS 16 adoption, we have changed our accounting policy for lease contracts, except for mineral leases, as the standard excludes from its scope leases to explore for or use minerals, oil, natural gas and similar non-regenerative resources.

As of December 31, 2019, we have recognized right-of-use assets and lease liabilities of US\$1.692 billion and US\$1.791 billion, respectively. We have non-cancellable lease commitments in the nominal amount of US\$2.383 billion.

For more information, see note 2 to our consolidated financial statements.

RESULTS OF OPERATIONS

For commentary on our results of operations for the year 2018 compared with 2017, please see pages 96-109 of our Form 20-F for the year ended December 31, 2018.

CONSOLIDATED REVENUES

In 2019, our net operating revenues from continuing operations were US\$37.570 billion, 2.7% higher than the net operating revenues for the same period in 2018, which were US\$36.575 billion. The increase was a result of higher iron ore and iron ore pellets sales prices (impact of US\$6.172 billion), reflecting the increase in the market reference price, partially offset by lower iron ore and iron ore pellets sales volumes (impact of US\$3.886 billion), as well as lower sales volumes from our base metals business (impact of US\$622 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 from continuing operations based on the geographical location of our customers.

	Net operating revenues by destination			
	2019		2018	
	(US\$ million)	(% of total)	(US\$ million)	(% of total)
North America				
Canada	717	1.9%	656	1.8%
United States	1,335	3.6	1,353	3.7
	<u>2,052</u>	<u>5.5</u>	<u>2,009</u>	<u>5.5</u>
South and Central America				
Brazil	3,348	8.9	3,248	8.9
Other	641	1.7	822	2.2
	<u>3,989</u>	<u>10.6</u>	<u>4,070</u>	<u>11.1</u>
Asia				
China	18,242	48.6	15,242	41.7
Japan	2,603	6.9	2,743	7.5
South Korea	1,278	3.4	1,299	3.6
Taiwan	943	2.5	513	1.4
Other	1,091	2.9	1,854	5.1
	<u>24,157</u>	<u>64.3</u>	<u>21,651</u>	<u>59.2</u>
Europe				
Germany	1,683	4.5	1,653	4.5
United Kingdom	168	0.4	327	0.9
Italy	356	0.9	553	1.5
France	517	1.4	655	1.8
Other	2,470	6.6	2,919	8.0
	<u>5,194</u>	<u>13.8</u>	<u>6,107</u>	<u>16.7</u>
Rest of the world	<u>2,178</u>	<u>5.8</u>	<u>2,738</u>	<u>7.5</u>
Total	<u>37,570</u>	<u>100%</u>	<u>36,575</u>	<u>100%</u>

CONSOLIDATED OPERATING COSTS AND EXPENSES

Our cost of goods sold and services rendered from continuing operations decreased by US\$922 million, or 4.2%, to US\$21.187 billion in 2019 from US\$22.109 billion in 2018. Excluding depreciation, depletion and

amortization, our cost of goods sold and services rendered from continuing operations decreased by US\$1.114 billion reflecting lower sales volumes (US\$2.198 billion impact) and the positive effect of foreign exchange rates (US\$496 million impact), which were partially offset by higher costs (US\$1.581 billion impact), mainly ferrous minerals costs (US\$849 million impact), due to increased volumes and prices of third-party iron ore fines acquisition, demurrage, maintenance and royalties.

Our selling and administrative expenses were US\$487 million in 2019, a 6.9% decrease from US\$523 million recorded in 2018. The decrease was mainly due to the positive effect of exchange rate variation (US\$20 million impact).

Our research and evaluation expenses totaled US\$443 million in 2019, an increase of US\$70 million, or 18.8%, from the US\$373 million expenses recorded in 2018, mostly due to an increase in our research and evaluation expenses associated with base metals businesses.

Our pre-operating and operational stoppage expenses totaled US\$1.153 billion in 2019, an increase of US\$882 million from the US\$271 million recorded in 2018, mainly due to the higher stoppage expenses related to the rupture of Dam I (US\$983 million impact), partially offset by lower pre-operating expenses at our S11D mine (US\$137 million impact).

Our other operating expenses, net, were US\$505 million in 2019, a 13.5% increase from US\$445 million recorded in 2018. The increase was mainly due to higher provisions for litigation, partially offset by lower provisions for a profit sharing program for eligible employees.

Expenses associated with the rupture of Dam I were US\$7.402 billion in 2019. These expenses consisted of obligations assumed, including decharacterization of the dams, indemnification and donations to those affected by the event, remediation of the affected areas and compensation to affected communities.

RESULTS OF OPERATIONS BY SEGMENT

Net operating revenue by segment

The following table summarizes our net operating revenues from continuing operations by product for the years indicated.

	Year ended December 31,			
	2019	% change	2018	% change
	(US\$ million, except for %)			
Ferrous minerals:				
Iron ore	23,343	14.7	20,354	9.9
Pellets	5,948	(10.6)	6,651	17.7
Ferroalloys and manganese	282	(37.9)	454	(3.2)
Other ferrous products and services	432	(8.9)	474	(1.9)
Subtotal	30,005	7.4	27,933	11.2
Base metals:				
Nickel and other products(1)	4,257	(7.7)	4,610	(1.2)
Copper concentrate(2)	1,904	(9.0)	2,093	(5.0)
Subtotal	6,161	(8.1)	6,703	(2.4)
Coal	1,021	(37.9)	1,643	4.9
Other products and services	383	29.4	296	(26.0)
Net operating revenues	37,570	2.7	36,575	7.7

(1) Includes nickel coproducts (copper) and byproducts (precious metals, cobalt and others).

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

Sales volumes

Production and sales of iron ore fines and iron ore pellets decreased mainly as a result of the suspension of operations following the rupture of Dam I and the stronger than usual weather-related seasonality. 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,	
	2019	2018
	(thousand metric tons, except where indicated)	
Ferrous minerals:		
Iron ore fines	267,992	307,433
Pellets	43,199	56,592
Manganese	1,063	1,572
Ferroalloys	127	141
ROM (run of mine)	1,314	1,548
Coal:		
Thermal coal	4,356	5,393
Metallurgical coal	4,427	6,240
Base metals:		
Nickel	206	236
Copper	244	274
Copper as nickel subproduct	122	105
PGMs (000' oz.)	319	374
Gold (000' oz.)	459	484
Silver (000' oz.)	1,830	2,169
Cobalt (metric tons)	4,273	4,974

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,	
	2019	2018
	(US\$ per metric ton, except where indicated)	
Ferrous minerals:		
Iron ore	87.10	66.21
Pellets	137.69	117.52
Manganese	139.05	162.51
Ferroalloys	1,057.23	1,178.50
Coal:		
Thermal coal	59.15	84.19
Metallurgical coal	172.53	190.60
Base metals:		
Nickel	14,064.04	13,666.83
Copper	5,445.05	5,637.80
Copper as nickel subproduct	5,414.50	5,440.00
Gold (US\$/oz)	1,418.52	1,254.15
Silver (US\$/oz)	15.44	14.43
Cobalt	26,093.40	62,910.72

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,		
	2019	2018	% change
	(US\$ million, except for %)		
Ferrous minerals:			
Iron ore.....	8,778	9,048	(3.0)%
Iron ore pellets.....	2,666	3,393	(21.4)
Ferroalloys and manganese	220	290	(24.1)
Other ferrous products and services.....	324	313	3.5
Subtotal	11,988	13,044	(8.1)
Base metals:			
Nickel and other products(1).....	2,867	3,060	(6.3)
Copper(2).....	905	960	(5.7)
Subtotal	3,772	4,020	(6.2)
Coal	1,638	1,575	4.0
Others.....	390	263	48.3
Total (excluding depreciation, depletion and amortization)	17,788	18,902	(5.9)
Depreciation, depletion and amortization	3,399	3,207	6.0
Total (including depreciation, depletion and amortization).....	21,187	22,109	(4.2)%

(1) Includes nickel coproducts (copper) and byproducts (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.

	Year ended December 31,		
	2019	2018	% change
	(US\$ million, except for %)		
Ferrous minerals:			
Iron ore	1,196	301	297.3%
Iron ore pellets.....	108	56	92.9
Ferroalloys and manganese	11	4	175.0
Other ferrous products and services	1	6	(83.3)
Subtotal	1,316	367	258.6
Base metals:			
Nickel and other products(1).....	147	119	23.5
Copper(2).....	68	22	209.1
Subtotal	215	141	52.5
Coal	29	30	(3.3)
Brumadinho event(3).....	7,402	—	N/A
Others	701	930	(24.6)
Total (excluding depreciation, depletion and amortization)	9,663	1,468	558.2
Depreciation, depletion and amortization.....	327	144	127.1
Total (including depreciation, depletion and amortization).....	9,990	1,612	519.7%

(1) Includes nickel coproducts (copper) and byproducts (precious metals, cobalt and others).

- (2) Does not include copper produced in our nickel operations.
 (3) In 2019, as a result of the rupture of Dam I, we created a special department in charge of reparation and development (*Diretoria Especial de Reparação e Desenvolvimento*), which is in charge of social, humanitarian, environmental and structural recovery measures in Brumadinho and other affected areas. This special department, which reports to our CEO, assesses the costs related to the Brumadinho event. These costs are not allocated to any operating segment because they are not directly related to any of our operating activities.

Adjusted EBITDA

The table below shows a reconciliation of our consolidated Adjusted EBITDA from continuing operations with our net income (loss) from continuing operations for the years indicated.

	Year ended December 31,	
	2019	2018
	(US\$ million)	
Income (loss) from continuing operations attributable to Vale's stockholders	(1,683)	6,952
Income (loss) attributable to non-controlling interests.....	(497)	36
Income (loss) from continuing operations	(2,180)	6,988
Depreciation, depletion and amortization	3,726	3,351
Income taxes	(595)	(172)
Financial results, net.....	3,413	4,957
Equity results and other results in associates and joint ventures(1)	681	182
Dividends received and interest from associates and joint ventures(2)	466	388
Impairment and disposal of non-current assets(3).....	5,074	899
Adjusted EBITDA from continuing operations	10,585	16,593
Adjusted EBITDA from discontinued operations (Fertilizers)	—	(3)
Total Adjusted EBITDA	10,585	16,590

- (1) For the year ended December 31, 2018, this line included dividends received and interest from associates and joint ventures, which are now described in the following line.
 (2) Includes remuneration of the financial instrument in the coal segment.
 (3) For the year ended December 31, 2018, this line was described as "special events."

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 disposal of non-current assets. For more information, see note 4 to our consolidated financial statements.

The following table summarizes our consolidated Adjusted EBITDA for each of our segments.

	Year ended December 31,	
	2019	2018
	Adjusted EBITDA	Adjusted EBITDA
	(US\$ million)	
Ferrous minerals:		
Iron ore.....	13,398	11,033
Pellets.....	3,432	3,356
Ferroalloys and manganese	51	160
Other ferrous products and services.....	116	162
Subtotal.....	16,997	14,711
Coal	(533)	181
Base metals:		
Nickel and other products (1).....	1,243	1,431
Copper (2).....	931	1,111
Subtotal.....	2,174	2,542
Brumadinho Event (3).....	(7,402)	—
Other (4).....	(651)	(841)
Total Adjusted EBITDA from continuing operations.....	10,585	16,593
Adjusted EBITDA from discontinued operations (Fertilizers)	—	(3)
Total Adjusted EBITDA.....	10,585	16,590

(1) Includes nickel coproducts (copper) and byproducts (precious metals, cobalt and others).

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

(3) In 2019, as a result of the rupture of Dam I, we created the Special Recovery and Development Board, which is in charge of social, humanitarian, environmental and structural recovery measures in Brumadinho and other affected areas. This board, which reports to the CEO, assesses the costs related to the Brumadinho event. These costs are not allocated to any operating segment because they are not directly related to any of our operating activities.

(4) The line "Others" includes sales and expenses of other products, services, research and development, investments in joint ventures and associates of other business and unallocated corporate expenses.

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 rupture of Dam I are not directly related to our operating activities and are therefore not allocated to any operating segment.

Ferrous minerals

- Our net operating revenues from sales of ferrous minerals totaled US\$30.005 billion in 2019, a 7.4% increase from US\$27.933 billion in 2018, mainly reflecting higher average realized sales prices of iron ore fines and iron ore pellets, partially offset by lower sales volumes of iron fines and iron ore pellets. Our average realized prices for iron ore fines in 2019 were 31.6% higher than our average realized prices in 2018. Our average realized prices for iron ore pellets in 2019 were 17.2% higher than our average realized prices in 2018. Our sales volume of iron ore fines decreased by 12.8% in 2019, compared to 2018, due to the impact of production stoppages following the rupture of Dam I and abnormal rains impacting shipments at our Northern System.

- Our cost of goods sold and services rendered from ferrous minerals, excluding depreciation, depletion and amortization, decreased by 8.1% in 2019, to US\$11.988 billion in 2019 from US\$13.044 billion in 2018. This decrease primarily reflects lower sales volumes, with an impact of US\$1.563 billion, partially offset by higher iron ore costs due to increased volumes of third-party acquisition, demurrage, maintenance and royalties (impact of US\$717 million). Our cost of goods sold and services rendered from ferrous minerals in 2019 was positively affected by exchange rate variation (impact of US\$342 million).
- Our net expenses from ferrous minerals, excluding depreciation, depletion and amortization, increased by 258.6%, to US\$1.316 billion in 2019, compared to US\$367 million in 2018, mainly as a result of the impact of stoppages following the rupture of Dam I (impact of US\$759 million). Our net expenses for ferrous minerals in 2019 were positively affected by exchange rate variation (impact of US\$25 million).
- Our Adjusted EBITDA from ferrous minerals was US\$16.997 billion in 2019, an increase of US\$2.286 billion, or 15.5%, compared to our Adjusted EBITDA in 2018. This increase primarily reflects the US\$367 million positive impact of foreign exchange rate variations in our costs and expenses, in addition to the increase in revenues and expenses and reductions in costs discussed above.

Base metals

- Our net operating revenues from sales of base metals totaled US\$6.161 billion in 2019, an 8.1% decrease from US\$6.703 billion in 2018. The decrease was mainly due to lower sales volumes of nickel and copper (12.9% and 11.1%, respectively) mainly due to decreased production in our operations, as a result of scheduled and unscheduled maintenance at our North Atlantic and Asian refineries, and the temporary stoppage at the Sossego and Onça Puma processing plants. This decrease was partially offset by higher average realized sales prices of nickel, reflecting the increase of 2.9% compared to 2018.
- Our cost of goods sold from base metals, excluding depreciation, amortization and depletion, decreased by 6.2% in 2019, to US\$3.772 billion in 2019 from US\$4.020 billion in 2018. This decrease primarily reflects lower sales volumes, with an impact of US\$501 million, partially offset by higher costs (impact of US\$387 million) due to the scheduled and unscheduled maintenance activities at the Copper Cliff Nickel Refinery, in Sudbury, and at the Clydach, Matsusaka and Long Harbour refineries, and the temporary stoppage of Onça Puma mine and plant and the Sossego processing plants, which resulted in lower production and in the reduction of fixed cost dilution. Our cost of goods sold and services rendered from base metals in 2019 was positively affected by exchange rate variation (impact of US\$132 million).
- Our net expenses from base metals, excluding depreciation, amortization and depletion, increased 52.5% in 2019, to US\$215 million in 2019 from US\$141 million in 2018. This increase reflects the stoppage expenses at Onça Puma and Sossego and higher research expenses related to the Hu'u copper project in Indonesia.
- Our Adjusted EBITDA from base metals was US\$2.174 billion in 2019, 14.5% lower than US\$2.542 billion in 2018, mainly due to higher expenses, costs not decreasing as much as operating revenues, as discussed above, and lower average realized prices for copper and cobalt.

Coal

- *Our net operating revenues from sales of coal* decreased by 37.9% to US\$1.021 billion in 2019, from US\$1.643 billion in 2018. The decrease is mainly attributable to lower sales volumes for both thermal and metallurgical coal (impact of US\$433 million) and lower realized sales prices, in each case for both thermal and metallurgical coal (impact of US\$109 million), as a result of deteriorated market conditions. Sales volumes of thermal coal totaled 4.356 million metric tons (“Mt”) in 2019, decreasing 1.037 Mt when compared to the same period in 2018, while sales volumes of metallurgical coal totaled 4.427 Mt in 2019, decreasing 1.813 Mt in relation to 2018.
- *Our cost of goods sold and services rendered from coal*, excluding depreciation, amortization and depletion, increased by 4.0% to US\$1.638 billion in 2019 from US\$1.575 billion in 2018, mainly due to impact of fixed cost dilution on lower sales volumes, higher logistics costs, and higher maintenance at processing plants.
- *Our net expenses from coal*, excluding depreciation, amortization and depletion, totaled US\$29 million in 2019, in line with 2018.
- *Our Adjusted EBITDA from coal* was a loss of US\$533 million in 2019, compared to a gain of US\$181 million in 2018, for the reasons described above.

IMPAIRMENT AND DISPOSAL OF NON-CURRENT ASSETS

In 2019, we recorded impairment and disposal of non-current assets of US\$5.074 billion. We recorded impairment of: (i) US\$2.511 billion due to the reduction in expected production levels of refined nickel product for the remaining useful life of our nickel mine in New Caledonia, (ii) US\$1.691 billion due to the review of expected productivity for metallurgical coal and thermal coal assets in Mozambique, and (iii) US\$119 million due to the review of the business plan related to certain forestry assets, leading to a reduction in the expected operational capacity of these assets.

We also recorded an additional provision of US\$240 million in relation to onerous contracts in our Midwest system for fluvial transportation and port structure. In 2019, we recorded a loss on disposal of non-current assets of US\$513 million related to non-viable projects and operating assets written off through sale or obsolescence, which includes the assets write-offs of the Córrego do Feijão mine and the other upstream dams in Brazil.

FINANCIAL RESULTS, NET

The following table details our financial results, net, from continuing operations for the years indicated.

	Year ended December 31,	
	2019	2018
	(US\$ million)	
Financial income(1)	527	423
Financial expenses(2)	(3,806)	(2,345)
Gains (losses) on derivatives, net	244	(266)
Net foreign exchange losses—Loans and borrowings	(111)	(2,666)
Other foreign exchange gains (losses), net	150	419
Indexation losses, net	(417)	(522)
Financial results, net	<u>(3,413)</u>	<u>(4,957)</u>

(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, participative stockholders' debentures, expenses of REFIS, interest on lease liabilities, financial guarantees, expenses with cash tender offer repurchased and others financial expenses (see note 6 to our consolidated financial statements).

In 2019, our financial results, net, was an expense of US\$3.413 billion compared to an expense of US\$4.957 billion in 2018. This mainly resulted from:

- Net foreign exchange loss of US\$111 million in 2019 compared to net foreign exchange loss of US\$2.666 billion in 2018, mainly due to the following:
 - The Brazilian *real* depreciated by 4.0% against the U.S. dollar in 2019, compared to a 17.1% depreciation of the Brazilian *real* in 2018.
 - Since January 1, 2019, we considered certain long-term loans payable to Vale International SA, for which settlement is neither planned nor likely to occur in the foreseeable future, as part of our net investment in that foreign operation. While in 2018, the foreign exchange differences arising on those long-term loans were reflected in our financial results (financial loss of US\$2.574 billion in 2018), in 2019 those foreign exchange differences were recognized as other comprehensive income. As of December 31, 2019, we recognized a loss of US\$483 million (US\$319 million, net of taxes) as “cumulative translation adjustments” in our stockholders' equity.
- The net effect of fair value changes in derivatives represented a gain of US\$244 million in 2019, compared to a loss of US\$266 million in 2018. This variation was derived from the following main categories of derivatives transactions:
 - *Currency and interest rate swaps.* We recognized a net gain of US\$42 million in 2019 from currency and interest rate swaps, compared to a net loss of US\$279 million in 2018. These swaps are primarily used to convert debt denominated in other currencies into U.S. dollars in order to protect our cash flow from exchange rate volatility.
 - *Nickel derivatives.* We recognized a net gain of US\$58 million in 2019 compared to a net loss of US\$25 million in 2018. All these transactions were settled in 2019.

- *Bunker oil, Gasoil and Brent derivatives.* We recognized a net gain of US\$42 million in 2019 compared to a net gain of US\$6 million in 2018. These gains resulted from the fair value of the hedge contracts and the variation is due to volatility in the spot price of bunker oil, brent crude oil and gasoil.
- *Others.* We recognized a gain of US\$102 million in the fair value of other derivatives instruments (including lenders' conversion options into our shares of Valor da Logística Integrada S.A. (VLI)), in 2019, compared to a gain of US\$32 million in 2018.
- An indexation loss of US\$417 million in 2019 compared to a loss of US\$522 million in 2018.
- An increase in financial expense of US\$1.461 billion, to US\$3.806 billion in 2019 from US\$2.345 billion in 2018, attributable primarily to: (i) US\$925 million increase in the fair value of our stockholders' debentures, due to the increase in their market value, (ii) US\$376 million increase in the fair value of our financial guarantees provided for certain associates and joint ventures and (iii) increased expenses in the amount of US\$76 million as a result of the adoption of IFRS 16 *Leases*, partially offset by lower loans and borrowings gross interest due to reduction in our debt.

EQUITY RESULTS AND OTHER RESULTS IN ASSOCIATES AND JOINT VENTURES

In 2019, the equity results and other results in associates and joint ventures accounted for a loss of US\$681 million compared to a loss of US\$182 million in the same period in 2018, mostly due to (i) the recognition of a provision of US\$501 million to mitigate and compensate the impacts from the rupture of Samarco's Fundão dam, which is the present value of the revised estimate in relation to Vale's responsibility to support Fundação Renova and is equivalent to 50% of Samarco's additional obligations over the next 11 years; (ii) the recognition of a provision of US\$257 million for decommissioning of the Germano dam owned by Samarco; and (iii) the present value adjustment of US\$163 million in investments in coal business, which were partially offset by the positive equity results in associates and joint ventures.

INCOME TAXES

In 2019, we recorded a net income tax benefit of US\$595 million, compared to a net income tax benefit of US\$172 million in 2018. In 2019, our effective tax rate was 21.4%, and it differed from our statutory tax rate, which is 34%, mainly due to: (i) unrecognized tax losses in the year (impact of US\$1.059 billion), (ii) tax benefit from the payment of interest on stockholders' equity (impact of US\$601 million), and (iii) savings derived from tax incentives from our iron ore, pellets, copper and nickel operations in the North and Northeast regions of Brazil (impact of US\$189 million) compared to the same period in 2018. The reconciliation from statutory tax rate to our effective tax rate is presented in note 8 to our consolidated financial statements.

LIQUIDITY AND CAPITAL RESOURCES

In the ordinary course of business, our principal funding requirements are for capital expenditures, dividend payments and debt service. We expect to meet these requirements, in line with our historical practice, by using cash generated from operating activities and borrowings.

Our investment budget for capital expenditures in 2020 is approximately US\$5 billion, including approximately US\$4.1 billion dedicated to sustaining our existing operations and replacement projects and approximately US\$900 million for project execution. A principal amount of US\$1.011 billion of our debt matures in 2020. We are constantly evaluating opportunities for additional cash generation. Finally, we are committed to continue the reduction in our costs and expenses, to reduce our debt leverage and to maintain discipline in capital allocation.

SOURCES OF FUNDS

Our principal sources of funds are our operating cash flow and borrowings. The amount of operating cash flow is strongly affected by global prices for our products. In 2019, our operating activities provided by cash flows from continuing operations of US\$12.110 billion, in line with the US\$12.901 billion provided in 2018. In 2019, our cash and cash equivalents were US\$7.350 billion compared to US\$5.784 billion in 2018.

In 2019, we borrowed US\$3.142 billion under our new export financing lines, long-term debts and new credit lines, compared to new borrowings of US\$1.225 billion in 2018.

USES OF FUNDS

In the ordinary course of business, our principal funding requirements are for capital expenditures, dividend payments and debt service. In addition, in 2019, we used a total amount of cash of US\$1.719 billion in matters related to the rupture of Dam I, of which US\$989 million was in connection with decharacterization of dams and obligations assumed under settlement agreements, and US\$730 million expenses was in connection with communication services, accommodation and humanitarian assistance, equipment, legal services, water, food aid, taxes, among others.

Capital expenditures

Our capital expenditures in 2019 amounted to US\$3.704 billion, including US\$3.160 billion dedicated to sustaining our existing operations and US\$544 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*.

Acquisitions

In 2019, we paid an aggregate amount of US\$926 million, net of cash received, to acquire New Steel Global NV (“New Steel”) and Ferrous Resources Limited (“Ferrous Resources”).

- In January 2019, we acquired 100% of the share capital of New Steel for total consideration of US\$496 million. New Steel is a company that develops processing and beneficiating technologies for iron ore through a dry process, which we expect to use in our operations in the future. The total consideration paid is mainly attributable to New Steel’s research project and development of intangible assets.
- In August 2019, we acquired 100% of the share capital of Ferrous Resources, a company that owns and operates iron ore mines near some of our operations in the state of Minas Gerais, Brazil, for consideration of US\$430 million, net of cash. Ferrous Resources was acquired as a bolt-on acquisition with additional mineral reserves and expected operational synergies.

Distributions and repurchases

We did not pay dividends or repurchase any of our shares in 2019.

In December 2019, our board of directors approved the declaration of interest on capital in the gross amount of US\$1.767 billion (R\$7.253 billion), equivalent to R\$1.414364369 per share, based on profit reserves. The decision regarding the interest on capital allocation will be made in due course, and it will not occur until we lift the suspension of our Shareholder Remuneration Policy.

Tax payments

We paid US\$1.376 billion in income tax in 2019, excluding the payments in connection with REFIS tax settlement, compared to US\$676 million in 2018. In 2019, we paid a total of US\$433 million in connection with the REFIS, compared to US\$452 million in the same period in 2018.

Liability Management

In 2019, we repaid US\$5.417 billion under our financing agreements, including a US\$2.270 billion early repurchase of bonds (through a cash tender offer and a bond redemption consummated in September and December 2019), the repayment of US\$2.142 billion of credit lines drawn in the first quarter of 2019 and the repayment of US\$1.005 billion in loans with development banks.

DEBT

As of December 31, 2019, our total outstanding debt was US\$13.056 billion (including US\$12.845 billion of principal and US\$211 million of accrued interest) compared with US\$15.466 billion as of December 31, 2018. As of December 31, 2019, US\$220 million of our debt was secured by our property, plant and equipment. As of December 31, 2019, the weighted average of the remaining term of our debt was 8.5 years, compared to 8.9 years in 2018.

As of December 31, 2019, the short-term debt and the current portion of long-term debt was US\$1.214 billion, 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 financing (US\$3.293 billion as of December 31, 2019).* 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\$5.949 billion as of December 31, 2019).* 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\$5.652 billion. Our subsidiary Vale Canada Limited has outstanding fixed-rate debt in the amount of US\$297 million.
- *Euro-denominated loans and financing (US\$225 million as of December 31, 2019).* This category includes loans from export credit agencies.

- *Euro-denominated fixed rate notes (US\$843 million as of December 31, 2019).* We have issued in public offering this series of fixed rate debt securities denominated in Euro an amount of €750 million.
- *Other debt (US\$2.535 billion as of December 31, 2019).* We have outstanding debt, principally owed to BNDES, Brazilian commercial banks and holders of infrastructure debentures, denominated in Brazilian *reais* and other currencies.

We have a variety of credit lines available, including the following, as of December 31, 2019:

- *We have two revolving credit facilities with syndicates of international banks, which will mature in 2022 and 2024. The revolving credit lines allow more efficient cash management, consistent with our strategic focus on reducing cost of capital. In March 2020, we drew US\$2 billion under our revolving credit line maturing 2022 and US\$ 3 billion under the revolving credit line maturing 2024.*
- *A R\$400 million financing agreement with BNDES to finance acquisition of equipment.*

Some of our long-term debt instruments contain financial covenants. In particular, instruments representing 18.8% 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, 2019, we were in compliance with our financial covenants.

As of December 31, 2019, the corporate financial guarantees we provided (within the limit of its direct or indirect interest) for certain associates and joint ventures totaled US\$1.655 billion.

CONTRACTUAL OBLIGATIONS

The following table summarizes our contractual obligations as of December 31, 2019. This table excludes other common non contractual obligations that we may have, including pension obligations, deferred tax liabilities and contingent obligations arising from uncertain tax positions, all of which are discussed in the notes to our consolidated financial statements.

	Payments due by period					Thereafter
	Total	Less than 1 year	2021	2022	2023	
			(US\$ million)			
Debt less accrued interest	12,845	1,012	788	1,026	1,192	8,827
Interest payments(1)	7,260	702	641	608	568	4,741
Purchase obligations(2)	9,077	3,956	1,029	710	552	2,830
Total	29,182	5,670	2,458	2,344	2,312	16,398

- (1) Consists of estimated future payments of interest on our loans, financings and debentures, calculated based on interest rates and foreign exchange rates applicable as of December 31, 2019 and assuming that (i) all amortization payments and payments at maturity on our loans, financings and debentures will be made on their scheduled payments dates, and (ii) our perpetual bonds are redeemed on the first permitted redemption date. Amounts do not include derivatives transactions.
- (2) The purchase obligations derive mainly from take-or-pay contracts, contracts for the acquisition of fuel and energy and the acquisition of raw materials and services. For more information, see note 32 to our consolidated financial statements.

OFF-BALANCE SHEET ARRANGEMENTS

As of December 31, 2019, we did not have any off-balance sheet arrangements as defined in Form 20-F.

CRITICAL ACCOUNTING POLICIES AND ESTIMATES

We believe that the following are our critical accounting policies. We consider an accounting policy to be critical if it is important to our financial condition and results of operations and if it requires significant judgments and estimates on the part of our management.

CONSOLIDATION

In some circumstances, our judgment is required to determine whether, after considering all relevant factors, we have either control, joint control or significant influence over an entity. Significant influence includes situations of collective control. We hold the majority of the voting capital in five joint arrangements (Aliança Geração de Energia S.A., Aliança Norte Energia Participações S.A., Companhia Hispano-Brasileira de Pelotização, Companhia Ítalo-Brasileira de Pelotização and Companhia Nipo-Brasileira de Pelotização), but our management has concluded that we do not have a sufficiently dominant voting interest to have the power to direct the activities of the entity, as the power to make relevant decisions shared with other parties, pursuant to the terms of shareholders' agreements. As a result, these entities are accounted for under the equity method.

MINERAL RESERVES AND MINES USEFUL LIFE

We regularly evaluate and update our estimates of proven and probable mineral reserves. These reserves are determined using generally accepted estimation techniques. Calculating our reserves requires us to make assumptions about future conditions that are uncertain, including future ore and metal prices, currency prices, inflation rates, mining technology, availability of permits, production and capital costs. Changes in some or all these assumptions could have a significant impact on our recorded proven and probable reserves.

The estimated volume of mineral reserves is used as basis for the calculation of depletion of the mineral properties and also for the estimated useful life, which is a major factor to quantify the provision for asset retirement obligation, environmental recovery of mines and impairment of long-lived assets. Any changes to the estimates of the volume of mine reserves and the useful lives of assets may have a significant impact on the depreciation, depletion and amortization charges and assessments of impairment.

ASSET RETIREMENT OBLIGATIONS

Expenditures relating to ongoing compliance with environmental regulations are charged against earnings or capitalized as appropriate. These ongoing programs are designed to minimize the environmental impact of our activities.

We recognize a liability for the fair value of our estimated asset retirement obligations in the period in which they are incurred, if a reasonable estimate can be made. We consider the accounting estimates related to reclamation and closure costs to be critical accounting estimates because:

- we will not incur most of these costs for a number of years, requiring us to make estimates over a long period;
- reclamation and closure laws and regulations could change in the future or circumstances affecting our operations could change, either of which could result in significant changes to our current plans;

- calculating the fair value of our asset retirement obligations requires us to assign probabilities to projected cash flows, to make long-term assumptions about inflation rates, to determine the applicable discount rates that reflect the current market assessments of the time value of the money and the risks specific to the liability; and
- given the significance of these factors in the determination of our estimated environmental and site reclamation costs, changes in any or all of these estimates could have a material impact on net income. In particular, given the long periods over which many of these charges are discounted to present value, changes in our assumptions about credit-adjusted risk-free interest rates could have a significant impact on the size of our provision.

The future costs of retirement of our mines and processing assets at all our sites are reviewed annually, in each case considering the actual stage of exhaustion and the projected exhaustion date of each mine and site. The future estimated retirement costs are discounted using applicable discount rates that reflect current market assessments of the time value of money and of the risks specific to the liability.

As of December 31, 2019, we estimated the fair value of our total asset retirement obligations to be US\$3.960 billion.

IMPAIRMENT OF NON-CURRENT ASSETS AND ONEROUS CONTRACTS

Non-financial assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount might not be recoverable. An impairment loss is recognized for the amount by which the asset's carrying value exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs of disposal ("FVLCD") and value in use ("VIU").

FVLCD is generally determined as the present value of the estimated future cash flows expected to arise from the continued use of the asset, including any expansion prospects, and its eventual disposal. VIU model is determined as the present value of the estimated future cash flows expected to arise from the continued use of the asset in its present form. VIU is determined by applying assumptions specific to the company's continued use and cannot take into account future development. These assumptions are different to those used in calculating fair value and consequently the VIU calculation is likely to give a different result to a FVLCD calculation.

Assets that have an indefinite useful life and are not subject to amortization, such as goodwill, are tested annually for impairment.

For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (Cash Generating Units ("CGUs")). Goodwill is allocated to CGUs or CGU groups that are expected to benefit from the business combinations in which the goodwill arose and are identified in accordance with the operating segment.

Non-current assets (excluding goodwill) in which the company recognized impairment in the past are reviewed whenever events or changes in circumstances indicate that the impairment may no longer be applicable. In such cases, an impairment reversal will be recognized.

For onerous contracts, a provision is recognized for certain long-term contracts when the present value of the unavoidable cost to meet our obligation exceeds the economic benefits that could be received from those contracts.

Significant judgments, estimates and assumptions are required to determine whether an impairment trigger has occurred and to prepare the our cash flows. Management uses the budgets approved as a starting point and key assumptions are, but not limited to: (i) mineral reserves and mineral resources measured by internal experts; (ii) costs and investments based on the best estimate of projects as supported by past performance; (iii) sale prices consistent with projections available in industry reports, considering the market price when appropriate; (iv) the useful life of each cash-generating unit (ratio between production and mineral reserves); and (v) discount rates that reflect specific risks relating to the relevant assets in each cash-generating unit.

These assumptions are subject to risks and uncertainties and may change our projections and, therefore, may affect the recoverable value of assets.

FAIR VALUES OF DERIVATIVES AND OTHER FINANCIAL INSTRUMENTS

Derivatives transactions that are not qualified for hedge accounting are classified and presented as an economic hedge, as we use derivative instruments to manage our financial risks as a way of hedging against these risks. Derivative financial instruments are recognized as assets or liabilities in the balance sheet and are measured at their fair values. Changes in the fair values of derivatives are recorded in the statement of comprehensive income or in stockholders' equity when the transaction is eligible for effective hedge accounting.

We use well-known market participants' valuation methodologies to compute the fair value of instruments. To evaluate the financial instruments, we use estimates and judgments related to present values, taking into account market curves, interest rates, exchange rates, counterparty (credit) risk adjustments, forward market prices and their respective volatilities, when applicable. We evaluate the impact of credit risk on financial instruments and derivative transactions, and we enter into transactions with financial institutions that we consider to have a high credit quality. The financial institution's credit risk tracking is performed making use of a credit risk valuation methodology that considers, among other information, published ratings provided by international rating agencies and other management judgments.

DEFERRED INCOME TAXES

We recognize deferred tax effects of tax loss carryforwards and temporary differences in our consolidated financial statements. We do not recognize a tax asset when it is not probable that it will be fully recoverable in the future.

Deferred tax assets arising from tax losses, negative social contribution basis and temporary differences are registered taking into consideration the analysis of future performance, based on economic and financial projections, prepared based on internal assumptions and macroeconomic, trade and tax scenarios that may be subject to changes in future.

When we prepare our consolidated financial statements, the provision for income tax is calculated individually for each entity of the Company based on Brazilian tax rates, (to comply with Brazilian tax legislation on foreign profits), on an accrual basis, by applying the differential between the nominal local tax rates (based on rules in force in the location of the entity) and the Brazilian rate.

Determining our provision for income taxes and our deferred tax assets and liabilities requires significant management judgment, estimates and assumptions about matters that are highly uncertain. For each income tax asset, we evaluate the likelihood of whether some portion or the entire asset will not be

realized. Deferred tax assets recognized in relation to accumulated tax loss carryforwards depends on our assessment of the probability of generation of future taxable profits within the legal entity in which the related deferred tax asset is recorded, based on our production and sales plans, commodity prices, operating costs, environmental costs, group restructuring plans for subsidiaries and site reclamation costs and planned capital costs.

LITIGATION

We disclose material contingent liabilities unless the possibility of any loss arising is considered remote, and we disclose material contingent assets where the inflow of economic benefits is probable. We discuss our material contingencies in note 28 to our consolidated financial statements.

We record an estimated loss from a loss contingency when information available prior to the issuance of our financial statements indicates that it is probable that an outflow of resources will be required to settle an obligation, and the amount of the loss can be reasonably estimated. In particular, given the nature of Brazilian tax legislation, the assessment of potential tax liabilities requires significant management judgment. By their nature, contingencies will only be resolved when one or more future events occurs or fails to occur, and typically those events will occur a number of years in the future. Assessing such liabilities, particularly in the Brazilian legal environment, inherently involves the exercise of significant management judgment and estimates of the outcome of future events.

The provision for litigation as of December 31, 2019, totaling US\$1.462 billion, consists of provisions of US\$455 million for labor, US\$300 million for civil, US\$696 million for tax and US\$11 million for environmental claims. These provisions do not include provisions related to the rupture of Dam I, which are reflected in the line Brumadinho Event in our statement of income. Claims for which the likelihood of loss, in our opinion and based on the advice of our legal counsel, is reasonably possible but not probable, and for which we have not made provisions, amounted to a total of US\$11.938 billion as of December 31, 2019, including claims of US\$773 million for labor claims, US\$1.518 billion for civil claims, US\$8.395 billion for tax claims, US\$1.094 billion for environmental claims and US\$158 million for Brumadinho event claims.

EMPLOYEE POST-RETIREMENT BENEFITS

We sponsor defined benefit pension and other post-retirement benefit plans covering some of our employees. The determination of the amount of our obligations for these benefits depends on certain actuarial assumptions. These assumptions are described in note 29 to our consolidated financial statements and include, among others, the discount rate, the expected long-term rate of return on plan assets and increases in salaries.

PROVISION RELATED TO SAMARCO MINERAÇÃO S.A.

The provision requires the use of assumptions that may be mainly affected by: (i) changes in scope of work required under the Framework Agreement as result of further technical analysis, (ii) uncertainty regarding the timing of resumption of Samarco's operations; (iii) updates in the discount rate; and (iv) resolution of existing and potential legal claims. As a result, future expenditures may differ from the amounts currently provided and changes to key assumptions could result in a material impact to the amount of the provision in future reporting periods. For each reporting period, we will reassess the key assumptions used by Samarco in the preparation of the projected cash flows and will adjust the provision, if required.

STREAMING TRANSACTIONS

Defining the gain on sale of mineral interest and the contract liabilities portion of the gold transaction requires the use of critical accounting estimates as follows: (i) discount rates used to measure the present value of future inflows and outflows; (ii) allocation of costs between nickel or copper and gold based on relative prices; and (iii) expected margin for the independent elements (sale of mineral rights and service for gold extraction) based on our best estimate.

THE RUPTURE OF DAM I

Provisions for costs arising from the rupture of Dam I are measured at the present value of management's best estimate of the expenditure required to settle the present obligations at the end of the reporting period. The measurement of the provision requires the use of significant judgments, estimates and assumptions.

The provision reflects the estimated costs to comply with our obligations in relation to the event. The provision may be affected by factors including, but not limited to: (i) changes in laws and regulations; (ii) changes in the current estimated market price of the direct and indirect cost related to products and services, (iii) changes in timing for cash outflows, (iv) changes in the technology considered in measuring the provision, (v) the number of individuals entitled to the indemnification payments, (vi) resolution of existing and potential legal claims, (vii) demographic assumptions, (viii) actuarial assumptions, and (ix) updates to the discount rate.

The discount rate used to determine the present value is a pre-tax rate that reflects current market assessments of the time value of money and the risks specific to the liability. The increase in the provision due to the passage of time is recognized as interest expense. Provisions are not recognized for future operating losses.

Therefore, future expenditures may differ from the amounts currently provided, because the realized assumptions and various other factors are not always under our control. These changes to key assumptions could result in a material impact to the amount of the provision in future reporting periods. At each reporting period, we will reassess the key assumptions used in the preparation of the projected cash flows and will adjust the provision, if required.

RISK MANAGEMENT

We have developed an 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. Our risk management strategy considers the impact on our business of market risk factors (market risk), risks associated with inadequate or failed internal processes, people, systems or external events (operational risk), risks arising from third-party obligations (credit 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), and risks associated with our business model, governance and political and regulatory conditions in countries in which we operate (strategic risk), among others.

RISK GOVERNANCE STRUCTURE

Our Compliance and Risk Committee advises our Board of Directors with respect to the risks we are exposed.

Our Board of Executive Officers has established four advisory committees (the Business 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, and (iv) compliance risks. The main responsibilities of these committees are, among others: promoting and spreading the culture of risk management in the company; supporting the first line of defense, described below; supporting our management on preventive monitoring of potential operational, geotechnical, strategy, finance and cyber risks; making preventive recommendations about potential risks; and recommending revisions about management instruments and risk prevention principles, in accordance with the Risk Management Policy.

In 2019, we approved a Risk Management Policy with the purposes described below.

- Supporting the strategic planning, budget and sustainability of our business.
- Strengthening the capital structure and asset management of our business, by including concepts and assumptions of management based on potential risk in operations, maintenance of assets and logistics modes.
- Strengthening our governance practices, based on lines of defense model described below.
- Using ISO 31000, ISO 55000 and COSO-ERM standards as references for risk management. For Operational Safety, adopting the RBPS (Risk Based Process Safety) as the operational safety management system.
- Measuring and monitoring our potential risks, on a consolidated basis, considering the effect of diversification, when applicable, of our entire business.
- 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.
- Assessing the impact of new investments, acquisitions and divestitures on our risk map and risk tolerance.

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:

- *Foreign exchange rates and interest rates.* Our cash flows are exposed to the volatility of several currencies against the U.S. dollar and of interest rate on loans and financings. While most of our product prices are indexed to U.S. dollars, most of our costs, disbursements and investments are indexed to 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* and euros. 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.

Our floating rate debt consists mainly of loans including export pre-payments, 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) in U.S. dollars.

- *Product prices and input costs.* We are also 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.

See note 33 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.

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 mitigate operational risk with new controls and improvement of existing ones, new mitigation plans and transfer of risk through insurance. 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.

Geotechnical Risk

Geotechnical risk management is the structured approach we take to manage the risks of dams, slopes and ore piles ruptures, with the potential to cause fatalities, impacts on the community, the environment and/or interrupt the Company's activities.

It is the structured approach Vale takes to manage, in particular, the risks of dams, slopes and ore piles ruptures with the potential to cause fatalities, impacts on the community, the environment and/or interrupt our activities, which are very significant to our business. Geotechnical risks are continuously monitored and are duly integrated to enterprise risk management. We have been working on the improvement of our tailings management practices by implementing a new tailings management system. This new and more rigorous system is based on the adoption of multiple layers of protection, including internal and external lines of defense.

Operational, Planning and Continuity Risk

Planning and operational continuity risks include risks that may paralyze 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.

Cyber Risk

Cybernetic 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 2019.

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.

Credit 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.

Compliance Risk

Anti-Corruption Risk

To guide everyone who works in our company or acts on its behalf on how to act with ethics and integrity, we rely on the Code of Conduct, which together with the Global Anti-Corruption Policy and the Global Anti-Corruption Manual comprise the Global Anti-Corruption Program. The program—which is under the responsibility of Corporate Integrity—states that we have zero tolerance for corruption and prohibit bribery in all its forms (direct or indirect).

Our Global Anti-Corruption Program has specific rules related to:

- Socioenvironmental investments must be previously approved by Corporate Integrity through an internal tool and must have a contract with anti-corruption and accountability clauses.
- Gifts and hospitalities involving public officials above a specific value must be previously approved by Corporate Integrity through an internal tool, as well as gifts in cash or equivalent, regardless of the amount.
- All suppliers, entities, associations, or any 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.

Strategic Risk

Strategic risk comprises governance, business model, external environment issues, regulatory, political, economic or social actions taken by governments or other stakeholders.

IV. SHARE OWNERSHIP AND TRADING

MAJOR SHAREHOLDERS

Our corporate capital is currently composed of 5,284,474,770 common shares and 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 February 28, 2020.

	Common shares owned	% of class
Litela Participações S.A.(1)	519,773,209	9.8%
Litel Participações S.A.(2)	74,832,355	1.4%
Caixa de Previdência dos Funcionários do Banco do Brasil—Previ(3)	337,233,710	6.4%
BNDESPAR(4)	323,496,276	6.1%
Bradespar S.A.(5)	293,907,266	5.6%
Mitsui	286,347,055	5.4%
BlackRock, Inc.(6)	272,614,219	5.2%
Directors and executive officers as a group	722,790	Less than 1%
Shares held in treasury.....	156,192,313	2.9%

- (1) In September 2019, Litel Participações S.A. executed a partial spinoff procedure. As a consequence, the assets of the split company were transferred to Litela Participações S.A., including 808,746,864 common shares issued by Vale. Before the spinoff, Litela was a wholly owned subsidiary of Litel Participações S.A. After this transfer, the stake in Vale's social capital held by Litel Participações S.A. decreased from 16.72% to 1.4%, and Litela became a party to the Shareholders' Agreement.
- (2) Litel Participações S.A. is a party to the Shareholders Agreement among Litela Participações S.A., BNDESPAR, Bradespar S.A. and Mitsui.
- (3) Since February 2020, PREVI became a holder of 6.38% of our shares, in part as a result of transfers from Litela.
- (4) BNDESPAR is a wholly owned subsidiary of BNDES. As reported in BNDESPAR's amended beneficial ownership report on Schedule 13D, filed with the SEC on January 10, 2019.
- (5) Bradespar is controlled by a control group consisting of Cidade de Deus—Cia. Comercial Participações, Fundação Bradesco, NCF Participações S.A. and Nova Cidade de Deus Participações S.A.
- (6) As of December 31, 2019, as reported in BlackRock, Inc.'s beneficial ownership report on Schedule 13G, filed with the SEC on February 6, 2020.

The table below sets forth information regarding ownership of Litela Participações S.A. as of December 31, 2019.

	Common shares owned	% of class
<i>Litela Participações S.A. shareholders(1)</i>		
BB Carteira Ativa	158,594,403	80.6%
Carteira Ativa II FIA	22,625,093	11.5%
PETROS.....	13,648,434	6.9%
Others.....	1,845,195	0.9
Total.....	196,713,125	100.0%

- (1) Both BB Carteira Ativa and Carteira Ativa II FIA are a Brazilian investment funds. BB Carteira Ativa is 100% owned by PREVI—Caixa de Previdência dos Funcionários do Banco do Brasil. Carteira Ativa II FIA is 100% owned by Fundação dos Economistas Federais—FUNCEF. Each of PREVI, FUNCEF and PETROS is a Brazilian pension fund, managing pension plans of employees of Banco do Brasil, Caixa Econômica Federal and, Petróleo Brasileiro S.A., respectively.

SHAREHOLDERS' AGREEMENT

In 2017, Litel, Bradespar, Mitsui and BNDESPAR executed the Shareholders' Agreement, by means of which they undertook to vote jointly on certain issues. In September 2019, following the partial spinoff of

Litel and the merger of the portion split into its subsidiary company Litela, Litela became a party to the Shareholders' Agreement. The following are key provisions of the Shareholders' Agreement:

- *Term:* The Shareholders' Agreement will be effective until November 9, 2020.
- *Shares subject to the agreement:* The Shareholders' Agreement will only apply to a portion of the common shares of Vale to be owned by the parties thereto, in a total amount of 20% of Vale's common shares (not including treasury shares). However, in any general shareholders' meeting, common shares owned by the parties to the Shareholders' Agreement but not subject to the agreement must be voted in accordance with the shares subject to the agreement.
- *Shareholders' prior meetings:* The Shareholders' Agreement does not require meetings thereunder prior to each meeting of the Vale Board of Directors or general shareholders' meeting, unless convened any of the parties to the proposed Vale shareholders' agreement.
- *Qualified quorum matters:* The Shareholders' Agreement requires approval, in a prior meeting, of shareholders holding at least 75% of the shares subject to the agreement owned by the parties in attendance for approval of the following matters, among others:
 - any amendment of Vale's bylaws;
 - any increase or reduction of Vale's capital stock;
 - any issuance of debentures of Vale, whether or not convertible into shares of Vale, call options (*bônus de subscrição*) or any other security of Vale;
 - any amalgamation, spin-off or merger to which Vale is a party, as well as any change to Vale's corporate form;
 - any dissolution, receivership, bankruptcy or any other voluntary act for financial reorganization of Vale or the suspension of any of these proceedings;
 - the removal of any member of Vale's Board of Directors, and the election and removal of any executive officer of Vale;
 - the approval of the aggregate and individual compensation of members of the Board of Directors, Board of Executive Officers and advisory committees;
 - creation of companies by Vale, the conversion of currently existing companies into another types of legal entity, the direct or indirect acquisition or disposition of Vale's interests in the capital stock of other companies or entities, including through mergers and spin-offs, as well as the amendment of the corporate documents of these legal entities, whenever the amount involved is equal or greater than 1% of Vale's shareholders' equity, based on Vale's most recent quarterly financial information;
 - the distribution or non-distribution of any dividends (including distributions classified as interest on shareholders' equity) on any shares of capital stock of Vale other than 50% of the net income;

- the creation of any security interest or guarantee by Vale to any third parties, including companies controlled by or affiliated with Vale, except for subsidiaries of which Vale owns at least 99% of the capital stock;
- the approval of Vale's maximum limit of indebtedness;
- the approval of Vale's strategic guidelines and plan, as well as annual and pluriannual budgets and fundraising plan;
- any investments or divestments by Vale, as well as any investment agreements, in an amount equal to or greater than 1% of Vale's shareholders' equity, based on Vale's most recent quarterly financial information;
- the approval of any related-party transactions policy;
- the disposal of fixed assets of Vale in an amount exceeding (i) separately, 0.15% of Vale's total assets, or (ii) in the aggregate, in a twelve-month period, 0.5% of Vale's total assets, based on Vale's most recent quarterly financial information;
- the cancellation of Vale's listing or the reduction of Vale's listing level on the B3; and
- the appointment and removal by Vale's Board of Executive Officers of the chief executive officer in subsidiaries, companies affiliated with Vale or other companies in which Vale is entitled to appoint the chief executive officer.

RELATED PARTY TRANSACTIONS

We have a policy on related party transactions, which 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. The definition of related party is based on applicable accounting standards and on this internal policy, which may be more restrictive than applicable laws and regulations under certain circumstances. Our Audit 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. Under the policy, 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. In addition, if we identify a conflict of interest with a member of the Board of Directors or an executive officer, then such member of the Board or executive officer may not participate in any discussions or have access to any information or document related to the matter. The policy also prohibits the extension of any loans to related parties other than our subsidiaries and affiliated companies. For information regarding investments in associate companies and joint ventures and for information regarding transactions with major related parties, see notes 16 and 31 to our consolidated financial statements.

We have engaged, and expect to continue to engage, in arm's-length transactions with certain entities controlled by, or affiliated with, our principal shareholders.

BRADESCO

Bradespar is controlled by a group of entities that also control Banco Bradesco S.A. ("Bradesco"). Bradesco and its affiliates are full-service financial institutions that 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.

BANCO DO BRASIL

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 the majority of the common equity of Litela Participações S.A. and Litel Participações S.A., which in turn hold together 11.2% of the common shares of Vale. 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.

MITSUI

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. Mitsui has an indirect stake in Vale Moçambique and Nacala Corridor Holding, which controls the coal operations (mine, rail and port) in Mozambique (see *Overview—Business overview—Significant changes in our business*).

BNDES

BNDES is the Brazilian state-owned development bank and the parent company of one of our major shareholders, BNDESPAR. Below is a description of our main transactions with BNDES:

We and BNDES are parties to a contract relating to authorizations for mining exploration. This contract, which we refer to as the Mineral Risk Contract, provides for the joint development of certain unexplored mineral deposits that form part of our Northern System, except for our iron ore and manganese ore deposits which were specifically excluded from the contract, as well as proportional participation in any profits earned from the development of such resources. In 2007, the Mineral Risk Contract was extended indefinitely, with specific rules for all exploration projects and exploration targets and mineral rights covered under the contract.

BNDES has provided us with credit lines of R\$3.9 billion (US\$1.2 billion) financing for our CLN 150 Mtpy project and a R\$6.2 billion (US\$1.9 billion) financing for our S11D project and its infrastructure (CLN S11D). For more information on our transactions with BNDES, see *Operating and Financial Review and Prospects—Liquidity and capital resources*.

BNDES holds a total of R\$715 million (US\$177 million), in debentures of our subsidiary Salobo Metais S.A., with a right to subscribe for Salobo's preferred shares in exchange for part of the outstanding debentures, which right expires two years after Salobo reaches an accumulated revenue equivalent to 200,000 metric tons of copper.

BNDES holds debentures issued by Vale exchangeable into common shares of VLI.

BNDESPAR is in the control group of several Brazilian companies with which we have commercial relationships in the ordinary course of our business.

DISTRIBUTIONS

Immediately following the rupture of Dam I, our Board of Directors determined the suspension of our dividend policy, and therefore no payment of dividends or interest on shareholders' equity will be made pursuant to Vale's Distribution Policy, and no decision with respect to share buyback will be made until further determination of our Board of Directors.

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—Memorandum and articles of association*.

The tax regime applicable to distributions to ADR and to non-resident shareholders 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 per share(1)	U.S. dollars total(1)
		Dividends	Interest on equity	Total	Total	(US\$ million)
2015.....	April 30	–	0.60	0.60	0.19	1,000
	October 31	0.37	–	0.37	0.10	500
2016.....	December 16	–	0.17	0.17	0.05	250
2017.....	April 28	–	0.91	0.91	0.28(2)	1,470(2)
2018.....	March 15	–	0.91	0.91	0.28(2)	1,451(2)
	September 20	0.17	1.31	1.48	0.36(2)	1,861(2)
2019(3).....	–	–	1.41	1.41	–	–

(1) As approved by the Board of Directors.

(2) Calculated based on the exchange rate for the US dollar (Ptax-Option 5) published by the Central Bank of Brazil (BCB), on the day prior to payment.

(3) On December 19, 2019, the Board of Directors approved interest on equity, according to the Brazilian Law. Pursuant to the determination of the Board of Directors to suspend the Shareholder Remuneration Policy, no payment of interest on shareholders' equity has been made, and will not be made during the suspension of the Shareholder Remuneration Policy.

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 depositary for the common ADSs. On December 31, 2019, there were 1,150,143,671 common ADSs outstanding, representing 21.8% of our total share capital.

In December 2019, we concluded the delisting of our common ADSs from the Euronext Paris.

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.

Depository Shares

The depository reimburses us for certain expenses we incur in connection with the ADR programs and other expenses, subject to a ceiling agreed between us and the depository 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 depository also agreed to make an additional reimbursement annually based on the issuance and cancellation fees, dividend fees and depository service fees charged by the depository to our ADS holders. For the year ended December 31, 2019, Citibank N.A. reimbursed us US\$13.083 million.

PURCHASES OF EQUITY SECURITIES BY THE ISSUER AND AFFILIATED PURCHASERS

Vale did not engage in any share repurchases during 2019.

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 13 members and 13 alternates, each of whom serves on behalf of a particular director. One member and his or her alternate are directly elected by our employees, in a separate election. Our bylaws provide that the chief executive officer cannot serve as chairman of the Board of Directors.

The Board of Directors holds regularly scheduled meetings on a monthly basis and holds additional meetings when called by the chairman, vice-chairman or any two directors. Decisions of the Board of Directors require a quorum of a majority of the directors and are taken by majority vote. Alternate directors may attend and vote at meetings in the absence of the director for whom the alternate director is acting.

All members (and their respective alternates) are elected for the same two-year term at a general shareholders' meeting, can be re-elected, and are subject to removal at any time. At the 2019 Shareholders Annual Meeting, 13 members of the Board of Directors were elected, with 12 members elected by the cumulative voting process and one member elected by the employees, in a separate election. In November and December 2019, two positions of members and one position of alternate member of the Board of Directors became vacant due to resignations. The Board of Directors approved the appointment of two new members and one alternate member for a term lasting until the 2020 Annual Shareholders' Meeting, which will be held in April 2020 and at which the shareholders will vote on a proposal to elect 12 members. The terms of all of our directors and alternate directors will expire at the Ordinary General Shareholder's meeting of 2021.

Nine of our thirteen current directors (and seven of our ten alternate directors) were appointed by the parties to the Shareholders' Agreement. Non-controlling shareholders holding common shares representing at least 15% of our voting capital may elect a member and an alternate to our Board of Directors, in a separate election process. Shareholders representing 5% of our voting capital may demand the adoption of a cumulative voting procedure. See *Additional Information—Memorandum and articles of association—Voting rights*.

New listing rules applicable to independence requirements for the Novo Mercado came into force in January 2018. Pursuant to the Novo Mercado listing rules and our bylaws, at least two directors or 20% of our directors, whichever number is higher, must be independent. We currently have three independent members of our Board of Directors. To be considered independent under our bylaws and the Novo Mercado listing rules in effect in 2018, a director may not (i) have current professional ties to Vale other than as a member of the Board of Directors or be a significant shareholder of Vale; (ii) have been an employee or executive of Vale or of any party to the Shareholders' Agreement for at least the past three years; (iii) sell goods or services to or purchase goods or services from Vale; (iv) be affiliated with any party to the Shareholders' Agreement; (v) be a relative, to the second degree, of any director or executive of Vale; (vi) have been a member of Vale's audit committee in the past three years; and (vii) be an affiliate of any non-profit organization receiving significant financial resources from Vale. The current composition of Vale's Board of Directors is in compliance with the rules established by the Novo Mercado special segment of B3.

The following table lists the current members of the Board of Directors and each director's alternate.

Director	Year first elected	Alternate director	Year first elected
José Maurício Pereira Coelho (chairman)	2019	Arthur Prado Silva	2015
Fernando Jorge Buso Gomes (vice-chairman)	2015	Johan Albino Ribeiro	2019
Eduardo de Oliveira Rodrigues Filho	2019	Vacant	—
Isabella Saboya de Albuquerque(1)	2017	Adriano Cives Seabra(1)	2019
José Luciano Duarte Penido	2019	Vacant	—
Lucio Azevedo(2)	2015	Iran da Cunha Santos(2)	2019
Marcel Juvinião Barros	2012	Marcia Fragoso Soares	2019
Murilo Cesar Lemos dos Santos Passos	2019	Gilmar Dalilo Cezar Wanderley	2017
Oscar Augusto de Camargo Filho	2003	Ken Yasuhara	2019
Patricia Gracindo Marques de Assis Bentes(1)	2019	Marcelo Gasparino da Silva(1)	2019
Roger Allan Downey	2019	Ivan Luiz Modesto Schara	2019
Sandra Maria Guerra de Azevedo(1)	2017	Vacant	—
Toshiya Asahi	2017	Hugo Serrado Stoffel	2019

(1) Independent directors.

(2) Appointed by our employees.

Below is a summary of the business experience, activities and areas of expertise of our current directors.

JOSÉ MAURÍCIO PEREIRA COELHO	Born:	1966
Chairman of the Board, Member of the Personnel and Governance Committee	First elected:	2019
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> Chief Executive Officer of the Employees' Pension Fund of Banco do Brasil—Previ Director and Member of the Audit and Risk Committee of Ultrapar Participações S.A. Chairman of the Deliberative Board of Associação Brasileira das Entidades Fechadas de Previdência Complementar ("Abrapp")
	Business experience:	<ul style="list-style-type: none"> Chief Executive Officer of Banco do Brasil ("BB") Seguridade Participações S.A. Vice-President of Finance and Investor Relations of Banco do Brasil S.A. Finance Director of Banco do Brasil S.A.

<p>FERNANDO JORGE BUSO GOMES Vice Chairman, Coordinator of the Finance Committee and Personnel and Governance Committee</p>	<p>Born: 1956 First elected: 2015</p>	<p>Business experience:</p> <ul style="list-style-type: none"> • Coordinator of Vale's Sustainability Committee • Vice Chairman of the Board of Directors of Bradespar S.A. • Chief Executive Officer and Director of Investor Relations of Bradespar S.A. • Member of Vale's Executive Development Committee • Member of Vale's Strategy Committee • Executive Officer of Valepar S.A. • Director of Valepar S.A. (and Vice-Chairman of Board of Directors) • Chairman of the Board of Directors of Smartia Corretora de Seguros S.A. • Chairman of the Board of Directors of SMR Grupo de Investimentos e Participações S.A. • Director of BCPAR S.A. • Director of BR Towers S.A.
<p>EDUARDO DE OLIVEIRA RODRIGUES FILHO Director, Coordinator of the Compliance and Risk Committee</p>	<p>Born: 1954 First elected: 2019</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Managing Partner of CWH Consultoria em Gestão Empresarial <p>Business experience:</p> <ul style="list-style-type: none"> • Member of Vale's Finance Committee and Sustainability Committee • Alternate Director of Valepar S.A. • Commercial Director of Rio Tinto Brasil • Commercial Manager at Minerações Brasileiras Reunidas S.A.
<p>ISABELLA SABOYA DE ALBUQUERQUE Director and Coordinator of Audit Committee</p>	<p>Born: 1970 First elected: 2017</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Director, Coordinator of the Related Parties Committee and Member of the Personnel Committee of Wiz Soluções e Serviços de Corretagem S.A. • Member of the Abrapp/Sindapp/ICSS Board of Self-Regulation in Investment Governance • Member of the State Governance Market Advisory Chamber of B3 <p>Business experience:</p> <ul style="list-style-type: none"> • Director and Coordinator of the Audit Committee at IBGC • Director and Coordinator of the Audit Committee of BR Malls S.A. • Partner at Jardim Botânico Investimentos S.A.

<p>JOSÉ LUCIANO DUARTE PENIDO Director, Coordinator of the Sustainability Committee and Member of the Compliance and Risk Committee</p>	<p>Born: 1948 First elected: 2019</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Director of Copersucar S.A. • Independent Director, Member of the Human Talent Committee and the Audit and Risk Committee of Algar S.A. • Member of Vale's Compliance and Risk Committee and Coordinator of Vale's Sustainability Committee <p>Business experience:</p> <ul style="list-style-type: none"> • Director of Banco Santander Brasil • Independent Director of Química Amparo Ypê • Chairman of the Board of Directors of Fibria Celulose
<p>LUCIO AZEVEDO Director</p>	<p>Born: 1958 First elected: 2015</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Employee of Vale (currently released for union activity) • President of the Employees' Union of Railway Companies of the Brazilian states of Maranhão, Pará and Tocantins
<p>MARCEL JUVINIANO BARROS Director, Member of the Sustainability Committee</p>	<p>Born: 1962 First elected: 2012</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Security Director of PREVI—Pension Fund for Banco do Brasil Employees <p>Business experience:</p> <ul style="list-style-type: none"> • Member of Vale's Personnel and Governance Committee • Member of Vale's Executive Development Committee • Director of UN-PRI (Principles for Responsible Investments) • Effective Director of Valepar

<p>MURILO CÉSAR LEMOS DOS SANTOS PASSOS Director and Member of the Finance Committee</p>	<p>Born: 1947 Term expires: 2021</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Director of Instituto Ecofuturo-Futuro para o Desenvolvimento Sustentável and of Fundação Nacional da Qualidade • Member of the Management Committee of Suzano Holding S.A. • Director of São Martinho S.A. • Director of Odontoprev S.A. • Chairman of the Board of Directors of Tegma Gestão e Logística S.A. • Director of IPLF Holding S/A • Director of Suzano Holding S.A. <p>Business experience:</p> <ul style="list-style-type: none"> • Chairman of the Board of Directors of CCR S.A. • Chairman of the Board of Directors of CPFL Energia • Superintendent-Officer of Bahia Sul Celulose S.A. • Superintendent-Officer of Celulose Nipo-Brasileira S.A.—Cenibra Florestas do Rio Doce S.A • Various positions at Vale in several divisions, such as environment, metallurgy and forest products
<p>OSCAR AUGUSTO DE CAMARGO FILHO Director</p>	<p>Born: 1938 First elected: 2003</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Managing Partner of CWH Consultoria Empresarial <p>Business experience:</p> <ul style="list-style-type: none"> • Member of Vale's Strategy Committee • Coordinator of Vale's Executive Development Committee and Vale's Personnel Committee • Several positions at Grupo Caemi, including Commercial Director of MBR, President of Caemi Internacional (trading), CEO of Caemi (holding) • Director of MRS Logística • Chairman of the Board of Directors of Quebec Cartier Mining Co., Canada
<p>PATRICIA GRACINDO MARQUES DE ASSIS BENTES Director, Member of the Sustainability Committee</p>	<p>Born: 1965 First elected: 2019</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Chairman of the Board of Directors of Cia Melhoramentos de São Paulo • Director of Light S.A. • Member of the Fiscal Council of Braskem S.A. <p>Business experience:</p> <ul style="list-style-type: none"> • Director of the CEMIG Group • Director of Renova Energia S.A.

<p>ROGER ALLAN DOWNEY Director and Member of the Compliance and Risk Committee</p>	<p>Born: 1967 First elected: 2019</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Director and Chief Executive Officer of Fertimar S.A. (PrimaSea) <p>Business experience:</p> <ul style="list-style-type: none"> • Chief Executive Officer of Vale Fertilizantes S.A. • Chief Executive Officer of MMX Mineração e Metálicos S.A. • Director of Mining & Steel Research of Credit Suisse • Commercial manager of Rio Tinto Brasil
<p>SANDRA MARIA GUERRA DE AZEVEDO Director and Member of the Personnel and Governance Committee</p>	<p>Born: 1955 First elected: 2017</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Founding Partner of Better Governance Consulting Services • Member of the Vale's Personnel and Governance Committee and Governance, Compliance and Risk Committee • Accredited Mediator at CEDR—Centre for Effective Dispute Resolution, London <p>Business experience:</p> <ul style="list-style-type: none"> • Director of Global Reporting Initiative—GRI • Director of Vix Logística S.A. • Director of Companhia Paranaense de Energia—Copel S.A. • Chairman of the Board of Directors of the Brazilian Institute of Corporate Governance—IBGC
<p>TOSHIYA ASAHI Director</p>	<p>Born: 1966 First elected: 2017</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Vice President of Mitsui & Co. (Brasil) S.A. • Director of Petrobras Gás S.A.—Gaspetro <p>Business experience:</p> <ul style="list-style-type: none"> • Deputy General Manager of New Metals and Aluminum of Mitsui & Co. Ltd. • Assistant Executive, Secretariat Div., Mitsui & Co Ltd

ADVISORY COMMITTEES TO THE BOARD OF DIRECTORS

Our bylaws provide for the following advisory committees to the Board of Directors, each governed by its own internal rules.

- The *Personnel and Governance Committee*, which is responsible for evaluating the company's human resources general policies as submitted by the Executive Board to the Board of Directors; evaluating the adequacy of the compensation model for members of the Board of Executive Officers and the proposed annual, global budget for the compensation of executives; supporting the Board of Directors in setting and monitoring of goals for performance evaluation of our executive officers and certain other key managers; supporting the Board of Directors in the process of selecting and appointing the Chief Executive Officer, as well as evaluating the appointment of the other members of the Executive Board and other leaders who report directly to the Chief Executive Officer; supporting the Board of Directors in setting and monitoring the goals for performance

evaluation of the leader responsible for the Governance Secretary; supporting the Board of Directors in the drafting and maintenance of Vale's Nomination Policy, applicable to members of the Board of Directors, Board of Executive Officers and leaders who report directly to the CEO, in accordance with the legal requirements and the best corporate governance practices; periodically evaluating and recommending adjustments to corporate governance best practices concerning the structure, size and composition of the Board of Directors and the Advisory Committees, as well as the balance of experiences, knowledge and diversity of profiles, and the leadership profile of its members, based on research and market evaluations by external consultancies and institutions, identifying, selecting and recommending potential candidates to the Board of Director's election at the Shareholder's General Meeting, including the appointment of new members to the Board of Directors in cases of absence, impediment or vacancy, among other matters. Since March 2020, the Personnel and Governance Committee is also playing the role as Nomination Committee until 2021, when a specific Committee will be set up for this purpose. The current members of the Personnel and Governance Committee are Fernando Jorge Buso Gomes (*coordinator*), José Maurício Pereira Coelho, Sandra Maria Guerra Azevedo, Arthur Prado Silva and Ana Silvia Matte (*external specialist*).

- The *Finance Committee*, which is responsible for evaluating the structure and conditions of investment and divestment transactions, including mergers, consolidations and spin-offs in which Vale is involved, evaluating the compatibility and consistency between the compensation level of shareholders and the parameters established in the annual budget and financial scheduling, as well as Vale's general policy on dividends and capital structure, evaluating Vale's annual budget and annual investment plan, evaluating Vale's annual funding plan and indebtedness limits, evaluating current and capital investments, monitoring the financial execution of capital expenditure projects, ongoing budget and cash flow, monitoring financial risks and controls, preparing and approving the Finance Committee's annual work plan, among other matters. The current members of the Finance Committee are Fernando Jorge Buso Gomes (*coordinator*), Gilmar Dalilo Cezar Wanderley, Adriano Cives Seabra, Hugo Cerrado Stoffel and Murilo César Lemos dos Santos Passos.
- The *Compliance and Risk Committee*, which is responsible for ensuring that the Company has structure and practices that ensure effectiveness in identifying and managing operational, geotechnical and operational continuity risks, encouraging and monitoring the development of a culture of risk awareness in all company decisions, as well as proactive behavior in managing them, monitoring Vale's Integrated Risk Map and Operational and Geotechnical Risk Matrix, especially risks with critical and very critical impacts, as well as proposing improvements in the mitigation plans, supporting the Board of Directors in setting the Company's limits of operational and geotechnical risk exposure, as well as the level of risk tolerance for the risk matrix of these matters, establishing the quadrants corresponding to the unacceptable level of risk and the level of continuous monitoring, monitoring risk events and operational controls from the perspective of the Integrated Risk Map, including those related to the safety of dams, waste dumps, sediment containment dykes and water reservoirs in the Company's mines, monitoring Vale's Governance Model, known as the Vale Production System ("VPS") ensuring the standardization of processes, policies, and best practices to enable continuously more productive, safe and environmentally responsible operations, and ensuring the integrity of the Company's assets, evaluating from a risk perspective the onerous assignment or transfer of assets, including mining rights, in addition to the waiver of rights and other transactions that are not provided for among the duties of the other Advisory Committees to the Board of Director. The current members of the Compliance and Risk Committee are Eduardo de Oliveira

Rodrigues Filho (*coordinator*), Hugo Cerrado Stoffel, José Luciano Duarte Penido and Roger Allan Downey.

- The *Sustainability Committee*, which is responsible for evaluating Vale's sustainability strategy, and ensuring that it is considered when setting overall strategy, evaluating Vale's policies and conduct related to Safety, the Environment, Health, Social Performance, Communication and Institutional Relations, evaluating and proposing Vale's adherence to national or international initiatives or agreements related to socio-environmental responsibility matters, and monitoring the preparation and disclosure of the sustainability report, monitoring all operational risks and controls from the perspective of the integrated risk map, including risks to safety and the environment, health and social actions and reputational risks, as well as proposing improvements in risk mitigation plans, among other matters. The current members of the Sustainability Committee are José Luciano Duarte Penido (*coordinator*), Johan Albino Ribeiro, Marcel Juvinião Barros, Patrícia Gracindo Marques de Assis Bentes and Carlos Alberto de Oliveira Roxo (*external specialist*).
- The *Audit Committee*, which is responsible for advising our Board of Directors with respect to, among other matters, the appointment and dismissal of our independent auditors; evaluating quarterly, interim, and annual financial reporting; overseeing the work performed by our internal auditors and internal controls department; monitoring our exposure to risk; monitoring and making recommendations regarding the correction or improvement of internal policies (including a policy on related-party transactions); monitoring and making recommendations regarding related party transactions and mechanisms to address conflicts of interest; and establishing procedures for the receipt, retention and treatment of complaints related to accounting, controls and audit issues, as well as procedures for the confidential anonymous submission of concerns regarding such matters. The current members of the Audit Committee are Isabella Saboya de Albuquerque (*coordinator*), Luciana Pires Dias and Sergio Ricardo Romani.

INDEPENDENT AD HOC ADVISORY COMMITTEES TO THE BOARD OF DIRECTORS CREATED IN RESPONSE TO THE DAM I RUPTURE

Following the rupture of Dam I, our Board of Directors also established three independent ad hoc advisory committees to support the Board in matters relating to the dam rupture: (i) the Independent Ad Hoc Consulting Committee for Investigation (CIAEA), (ii) the Independent Ad Hoc Consulting Committee for Support and Recovery (CIAEA-R) and (iii) the Independent Ad Hoc Consulting Committee for Dam Safety (CIAESB).

The first two committees concluded their work in 2020. See *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine—Vale's response—Determination of the causes for the rupture of the dam*. In March 2020, our Board of Directors decided to extend the term of the CIAESB for one year. The CIAESB was established to evaluate safety conditions of our dams, prioritizing upstream structures, structures in alert zones, among others, with purpose of identifying and recommending measures to strengthen safety at these structures, based on national and international advanced methodologies. The committee is responsible for examining the action plans proposed by our management regarding the safety of the dams, governance related to security management plans and to recommend measures for their improvement. The committee is chaired by Flávio Miguez de Mello, and also includes Willy Lacerda and Pedro Repetto, all independent members with unblemished reputation and notable technical expertise.

EXECUTIVE OFFICERS

The executive officers 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 11 executive officers. The executive officers hold weekly meetings and hold additional meetings when called by any executive officer. Under Brazilian corporate law, executive officers must be Brazilian residents.

The Board of Directors appoints executive officers for two-year terms and may remove them at any time. The following table lists our current executive officers.

Officer	Year of appointment	Position
Eduardo de Salles Bartolomeo	2019	Chief Executive Officer
Luciano Siani Pires	2012	Chief Financial Officer and Executive Officer for Investor Relations
Marcello Magistrini Spinelli	2019	Executive Officer (Ferrous Minerals)
Vacant	—	Executive Officer (Base Metals)
Carlos Henrique Senna Medeiros	2019	Executive Officer (Safety and Operational Excellence)
Luiz Eduardo Frões do Amaral Osorio	2017	Executive Officer (Sustainability and Institutional Relations)
Alexandre Gomes Pereira	2017	Executive Officer (Business Support)
Fabio Schvartsman(1)	2017	Executive Officer (on leave)

(1) In March 2019, the Board of Directors approved the request for temporary leave of absence from Fabio Schvartsman.

Below is a summary of the business experience, activities and areas of expertise of our current executive officers.

EDUARDO DE SALLES BARTOLOMEO	Born:	1964
Chief Executive Officer	Appointed:	2019
	Business experience:	<ul style="list-style-type: none"> • Chairman of the Board of Directors of Login Logística Intermodal • Executive Officer for Base Metals of Vale • Director of Vale • Coordinator of Vale's Governance, Compliance and Risk Committee • Member of Finance Committee and Strategic Committee of Vale • Chief Executive Officer of Nova Transportadora do Sudeste • Director of Arteris S.A. • Chief Executive Officer of BHG—Brazilian Hospitality Group • Head of Logistical Operations of Vale • Director of MRS Logística S.A. • Chief Executive Officer of Petroflex

<p>LUCIANO SIANI PIRES Chief Financial Officer, Executive Officer for Investor Relations</p>	<p>Born: 1970 Appointed: 2012</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Chairman of the Board of Directors of VLI S.A • Director of The Mosaic Company <p>Business experience:</p> <ul style="list-style-type: none"> • Member of Finance Committee of Vale • Global Officer of Strategic Planning and Global Officer of Human Resources and Governance of Vale • Alternate Director of Vale • Director of Valepar • Director of Telemar Participações S.A. • Director of Suzano Papel e Celulose S.A. • Several executive positions at BNDES, including Executive Secretary and Chief of Staff of the Presidency and Head of Capital Markets and Export Finance • Consultant at McKinsey & Company
<p>MARCELLO MAGISTRINI SPINELLI Executive Officer for Ferrous Minerals</p>	<p>Born: 1973 Appointed: 2019</p>	<p>Business experience:</p> <ul style="list-style-type: none"> • Chief Executive Officer of VLI Logística S.A. • Chief Executive Officer of Ferrovia Centro Atlântica • Director of Ferrovia Norte e Sul • Chief Executive Officer of VLI Multimodal S.A. • Chief Executive Officer of VLI Operações Ferroviárias Independente • Chief Executive Officer of VLI Soluções S.A. • Various positions at Vale, including Logistics Officer
<p>CARLOS HENRIQUE SENNA MEDEIROS Executive Officer for Safety and Operational Excellence</p>	<p>Born: 1963 Appointed: 2019</p>	<p>Business experience:</p> <ul style="list-style-type: none"> • Executive President for North and Central America of Ball Corporation • Chairman of the Board of Directors of Envases de Centro América • Executive President for South America of Ball Corporation • Executive President for South America of Rexam PLC
<p>LUIZ EDUARDO FRÓES DO AMARAL OSORIO Executive Officer for Sustainability and Institutional Relations</p>	<p>Born: 1974 Appointed: 2017</p>	<p>Other current activities and director or officer positions:</p> <ul style="list-style-type: none"> • Chairman of the Board of Directors of Instituto Brasileiro de Mineração (“IBRAM”) <p>Business experience:</p> <ul style="list-style-type: none"> • Executive Vice-President of Legal and Company Relations of CPFL Energia S.A. • Director of CPFL Energias Renováveis S.A. • Vice-Chairman of the Board of Directors of Instituto CPFL • Executive Director of International Markets and Vice President for Sustainable Development and External Affairs of Raízen

ALEXANDRE GOMES PEREIRA Executive Officer for Global Business Support	Born:	1969
	Appointed:	2017
	Business experience:	<ul style="list-style-type: none"> • Senior Vice-President and Global Chief Information Officer of Vale based in Canada • Global IT Services Director of Vale • Global Chief Information Officer, Base Metals, of Vale Inco

CONFLICTS OF INTEREST

Under Brazilian corporate law, 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 board of executive officers regarding such transaction and must disclose the nature and extent of the conflicting interest for transcription in the minutes of the meeting. Under our Policy on Related Party Transactions, 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. For more details about our Policy on Related Party Transactions see *Share Ownership and Trading—Related party transactions*.

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 monitor management's activities, review the company's financial statements, and report its findings to the shareholders. We have a fiscal council established in accordance with Brazilian law. The primary responsibilities of the fiscal council under Brazilian corporate law are to monitor 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 30, 2019. The terms of the members of the Fiscal Council expire at the next annual shareholders' meeting following election.

Two members of our Fiscal Council (and the respective alternates) may be elected by non-controlling shareholders: one member may be appointed by the holders of our golden shares and one member may be appointed by minority holders of common shares pursuant to applicable CVM rules.

The following table lists the current and alternate members of the Fiscal Council.

Current member	Year first elected	Alternate	Year first elected
Marcelo Amaral Moraes	2004	Vacant	—
Raphael Manhães Martins(1).....	2015	Gaspar Carreira Junior(1).....	2017
Eduardo Cesar Pasa	2017	Nelson de Menezes Filho.....	2019
Marcus Vinicius Dias Severini.....	2017	Vacant	—
Marcos Prado Troyjo(2)	2019	Vacant(2)	—

(1) Appointed by minority shareholders of common shares.

(2) Appointed by the holder of golden shares.

Below is a summary of the business experience, activities and areas of expertise of the members of our Fiscal Council.

MARCELO AMARAL MORAES	Born:	1967
	First elected:	2004
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> • Member of the Fiscal Council of Gol Linhas Aéreas Inteligentes S.A. • Member of the Fiscal Council of Linx S.A. • Member of the Fiscal Council of Ultrapar Participações S.A.
	Business experience:	<ul style="list-style-type: none"> • Member of the Board of Directors of CPFL Energia S.A. • President of the Fiscal Council of Aceco TI S.A. • Member of the Board of Directors of Eternit S.A. • Managing Director of Capital Dynamics Investimentos Ltda.
RAPHAEL MANHÃES MARTINS	Born:	1983
	First elected:	2015
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> • Attorney for Faoro Advogados • Director of Eternit S.A. • Member of the Fiscal Council of OI S.A.—Em Recuperação Judicial • Member of the Fiscal Council of companies of the JHSF Participações S.A. Group
	Business experience:	<ul style="list-style-type: none"> • Director and Member of the Fiscal Council of companies of Grupo Light S.A.

EDUARDO CESAR PASA	Born:	1970
	First elected:	2017
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> Accounting Management Officer of Banco do Brasil S.A. Member of the Fiscal Council of Petrobras S.A. Alternate Member of the Fiscal Council of PREVI
	Business experience:	<ul style="list-style-type: none"> Member of the Deliberations Council of PREVI Coordinator of Controlling Committee of Vale Member of the Fiscal Council of Centrais Elétricas Brasileiras S.A. (Eletrobras) Member of the Fiscal Council of Cateno Gestão de Contas de Pagamento S.A. General Accounting Manager of Banco do Brasil S.A. Alternate Member of the Fiscal Council of Banco Votorantim S.A. Member of the Fiscal Council of BBTS-BB Tecnologia e Serviços Member of the Fiscal Council of CASSI
MARCUS VINÍCIUS DIAS SEVERINI	Born:	1957
	First elected:	2017
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> Member of Audit Committee of Valia
	Business experience:	<ul style="list-style-type: none"> Member of the Fiscal Council of BRF S.A. Member of the Fiscal Council of Mills Estruturas e Serviços de Engenharia S.A. Controller of Vale
MARCOS PRADO TROYJO	Born:	1966
	First elected:	2019
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> Special Secretary of Exterior Commerce and International Issues at Brazilian Economy Ministry
	Business experience:	<ul style="list-style-type: none"> Assistant teacher at Columbia University

AUDIT COMMITTEE

On March 11, 2020, our Board of Directors established an audit committee in accordance the governance rules of Novo Mercado segment of B3. Please see *Advisory Committees to the Board of Directors* above.

Under our bylaws and the Audit Committee's charter, (i) our Audit Committee shall have at least three members, (ii) each member must comply with the independence requirements of our bylaws of the Novo Mercado listing rules, (iii) at least one member must be an independent member of our Board of Directors, (iv) at least one member must not be a member of our Board of Directors and (v) at least one member must be must satisfy accounting / financial expertise requirements of the CVM. All members of our Audit Committee are appointed by the Board of Directors. The terms of the members of the Audit Committee expire at the end of the term of the members of the Board of Directors or upon removal approved by the Board of Directors, pursuant to the Audit Committee's charter.

We are subject to Rule 10A-3 under the Exchange Act, which requires, absent an exemption, that a listed company maintains a standing audit committee composed of members of the Board of Directors that

meet specified requirements. Prior to the creation of our Audit Committee, we relied on our Fiscal Council, which had certain additional powers to allow it to meet the requirements for exemption under paragraph (c)(3) of Rule. Since the establishment of our audit committee in accordance the governance rules of Novo Mercado segment of B3, we rely on our Audit Committee to meet the exemption requirements under paragraph (c)(3) of Rule 10A-3, and the Fiscal Council will no longer have expanded powers.

The following table lists the current members of the Audit Committee.

Current member	Year first elected
Isabella Saboya de Albuquerque(1)	2020
Luciana Pires Dias(2)	2020
Sergio Ricardo Romani(2)(3)	2020

(1) Member of our Board of Directors.

(2) Not a member of our Board of Directors.

(3) Accounting / financial expert.

Below is a summary of the business experience, activities and areas of expertise of the members of our Audit Committee.

ISABELLA SABOYA DE ALBUQUERQUE	Born:	1970
	First elected:	2020
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> • Director, Coordinator of the Related Parties Committee and Member of the Personnel Committee of Wiz Soluções e Serviços de Corretagem S.A. • Member of the Abrapp/Sindapp/ICSS Board of Self-Regulation in Investment Governance • Member of the State Governance Market Advisory Chamber of B3
	Business experience:	<ul style="list-style-type: none"> • Director and Coordinator of the Audit Committee at IBGC • Director and Coordinator of the Audit Committee of BR Malls S.A. • Partner at Jardim Botânico Investimentos S.A.

LUCIANA PIRES DIAS	Born:	1976
	First elected:	2020
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> • Partner at L. Dias Advogados • Member of the Audit Committee of B3 S.A.—Bolsa, Brasil, Balcão • Professor at Fundação Getúlio Vargas • Member of the Audit Committee of CERC Serviços de Desenvolvimento de Sistemas para Recebíveis Ltda. • Director of BNDES Participações S.A.
	Business experience:	<ul style="list-style-type: none"> • Member of the Audit Committee of Banco Nacional de Desenvolvimento Econômico e Social—BNDES • Member of the Technical Committee of CERC Serviços de Desenvolvimento de Sistemas para Recebíveis Ltda. • Professor at Fundação Getúlio Vargas • Finance Director at Comissão de Valores Mobiliários—CVM
SERGIO RICARDO ROMANI	Born:	1959
	First elected:	2020
	Other current activities and director or officer positions:	<ul style="list-style-type: none"> • Partner at SR Assessoria e Consultoria de Negócios Ltda.
	Business experience:	<ul style="list-style-type: none"> • Partner and Chief Executive Officer for Latin America South at Ernst & Young (EY) (1983-2019)

MANAGEMENT COMPENSATION

Under our bylaws, our shareholders are responsible for establishing the aggregate compensation we pay to the members of our Board of Directors, Board of Executive Officers, Fiscal Council and Board Committees. Once the total compensation has been approved in our Annual Shareholders' Meeting, it is the responsibility of the Board of Directors, with the support of the Personnel and Governance Committee, allocates the compensation among its members and the members of the Board of Executive Officers, Fiscal Council and Board Committees. Compensation proposals and policies are prepared with the support of the Personnel and Governance 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.

On January 27, 2019, in the context of events of exceptional severity, the Board of Directors determined the suspension of all variable compensation payments to our executive officers and certain other Vale leaders. We made a payment under the Performance Shares Units (PSU) program on January 15, 2019, prior to the suspension and prior to the rupture of Dam I.

As we continue to work towards the reparation of the impacts caused by the rupture of Dam I and investigation progresses, the Board of Directors has decided to resume variable compensation to executives who are not involved in the investigation discussions related to the rupture of Dam I. As a result, payments of variable compensation and long-term incentive grants suspended in 2019 are being made in 2020 to these executives.

With respect to the executives who have been removed from their activities for judicial reasons related to the rupture of Dam I, our Board of Directors understands that short-term and long-term variable compensation should remain suspended and will be individually discussed and defined with each executive who has been removed.

EXECUTIVE OFFICERS

As of December 31, 2019, we had seven executive officers: the CEO, five Executive Directors and one Executive Director on leave (due to investigations related to the rupture of Dam I). For the year ended December 31, 2019, the average annual compensation paid to our executive officers was R\$12.36 million (US\$3.13 million), the highest annual compensation paid to an executive officer was R\$15.10 million (US\$3.83 million) and the lowest annual compensation was R\$3.28 million (US\$0.83 million). The average annual compensation corresponds to the total aggregate compensation paid to executive officers in 2019 divided by the monthly average number of officers that received compensation during the year. The monthly average number of officers that received compensation during 2019 was 6.91. For the year ended

Management Compensation

December 31, 2019, the total payments related to executive officers' compensation packages is set forth in the table below.

	For the year ended December 31, 2019
	(R\$ million)
Annual fixed compensation	24.91
In-kind benefits and pension plans	8.13
Variable compensation(1)	25.68
Total amount paid in 2019 to current executive officers	58.72
Severance	17.90
Total amount paid in 2019 to current and former executive officers	76.62
Other expenses(2)	8.78
Total expenditures related to executive officers' compensation packages	85.40

- (1) Variable compensation in 2019 includes only the payment under the PSU long-term incentive Program (made on January 15, prior to the suspension and prior to the rupture of Dam I). Payments under the Annual Bonus (short-term incentive) and the Matching Program (long-term incentive) were suspended by the Board of Directors due to the rupture of Dam I, therefore were not paid in 2019.
- (2) Includes a hiring bonus for current executives and social security contributions on the compensation packages to current and former executives.

One of the core principles for designing the compensation package is the alignment with our performance and return to our shareholders. Under our Compensation Policy, the compensation package offered to our Board of Executive Officers (other than the Chief Executive Officer), assuming the achievement of target average performance, is composed as follows: 33% fixed compensation, 33% short-term (performance target based) variable compensation and 34% long-term (share-based incentives) variable compensation (23% under the Matching Program and 11% of PSU). Under our Compensation Policy, the compensation package offered to our Chief Executive Officer is composed as follows: 27% fixed compensation, 33% short-term (performance target-based) variable compensation and 40% long-term (share-based incentives) variable compensation (23% under the Matching Program and 17% of PSU). Members of our Board of Executive Officers may be entitled to additional compensation pursuant to an exceptional arrangement approved by the Board of Directors.

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, life insurance, driver and car expenses. Variable compensation consists of (i) an annual cash bonus, based on specific targets for each executive officer and on Vale's global cash generation, both approved by our Board of Directors, and (ii) payments tied to the performance of our shares under two programs, the Matching Program and the PSU. The Board of Directors suspended all the variable compensation payments in 2019 after the rupture of Dam I, and therefore payments under the bonus and Matching Program did not occur in this year, as well as Matching Program and PSU payments related to 2019. As mentioned above, the Board of Directors has decided to resume payments of variable compensation to certain executives who were not under investigation relating to the rupture of Dam I.

Pension, retirement or similar benefits consist of our contributions to Valia, the manager of the pension plans sponsored by us.

The short-term variable compensation component is based on our cash generation, taking into account economic and financial targets that reflect operating performance, as well as health and safety targets, sustainability and the accomplishment of strategic initiatives. The long-term variable portion is composed of our Matching Program and PSU. For the PSU program, payment is a direct function of our Total Shareholder Return (TSR) indicator's performance compared to a preselected group of comparable

companies. 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. Starting in 2020, 20% of the PSU performance indicator will be composed of Environment, Social and Governance (ESG) targets, in addition to the current TSR indicator.

Under our Matching Program, members of our Board of Executive Officers shall purchase a certain number of common shares or ADRs in the market within a purchase window through the plan administrator. At the end of a three-year cycle, participants are entitled to receive a reward equivalent to the same number of common shares or ADRs held through the end of the cycle (except where an exceptional arrangement has been approved by the Board of Directors). Participation in our Matching Program is mandatory for the members of our Board of Executive Officers in the years in which we pay cash bonuses. Members of our Board of Executive Officers cannot sell or transfer their common 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. Besides the payment suspension in 2019, the Board of Directors also suspended the official start of the 2019 Matching Program cycle to our executive officers, but resumed in 2020 for certain executives.

Since 2019, a stock ownership requisite was 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.

Under our PSU, our executive officers receive payments tied to Vale's performance, as compared to a selected group of mining companies, based on the total shareholder return (dividend or interest on equity payments and share appreciation) of the common shares of those companies during the vesting period. Starting in 2019, the PSU will have three-year cliff vesting (instead of four-year scaled vesting) for each cycle. The 2019 PSU cycle was also suspended to our executive officers in 2019, but resumed in 2020 for certain executives.

Our severance packages for qualified terminations may comprise: (i) a lump-sum severance payment, corresponding to one-half the annual fixed compensation for executive officers and equal to the annual fixed compensation for the Chief Executive Officer, paid shortly after the termination date; (ii) non-compete agreement compensation, to be paid in equal quarterly installments after termination; (iii) payment of any outstanding long-term variable compensation grants (Matching Program and PSU), paid shortly after the termination date; and (iv) payment of any outstanding short-term incentive plan (bonus), to be paid in April following the termination date. Severance expenditures in 2019 were related to six former executive officers who left the company in 2017, 2018 and 2019.

Social security contributions are mandatory contributions we are required to make to the Brazilian government for our executive officers.

Vale has also entered into indemnification agreements with its officers.

BOARD OF DIRECTORS

As of December 31, 2019 our Board of Directors had 13 members. For the year ended December 31, 2019, the average annual compensation paid to the members of our Board of Directors was R\$0.77 million (US\$0.19 million), the highest annual compensation paid to a member of the Board of Directors was R\$1.22 million (US\$0.31 million) and the lowest annual compensation was R\$0.54 million (US\$0.14 million). The monthly average number of members that received compensation during 2019 was 12.92.

In 2019, we paid R\$9.90 million (US\$2.51 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. On December 31, 2019, the total number of common shares owned by our directors and executive officers was 662,807. None of our directors or executive officers beneficially owns 1% or more of any class of our shares. Vale has also entered into indemnification agreements with its directors.

FISCAL COUNCIL

As of December 31, 2019 our Fiscal Council had 5 members. For the year ended December 31, 2019, the average, the highest and the lowest annual compensation paid to a member of the Fiscal Council was R\$0.44 million (US\$0.11 million). The monthly average number of members that received compensation during 2019 was 5.

We paid an aggregate of R\$2.20 million (US\$0.56 million) to members of the Fiscal Council in 2019. In addition, the members of the Fiscal Council are reimbursed for travel expenses related to the performance of their functions.

BOARD COMMITTEES

We paid an aggregate of R\$2.45 million (US\$0.62 million) to members of our permanent advisory committees in 2019. 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 limited to 50% of the amount of a directors' compensation. In 2019, we paid an aggregate of R\$1.43 million (US\$0.36 million) to the committee members that are also members of our Board of Directors and R\$1.02 million (US\$0.26 million) to other committee members. In addition, we paid an aggregate of R\$14.51 million (US\$3.63 million) to members of our independent ad hoc advisory committees in 2019. Members of our advisory committees are also reimbursed for travel expenses related to the performance of their duties.

EMPLOYEES

The following tables set forth the number of our employees by business and by location as of the dates indicated.

	As of December 31,		
	2019(1)	2018(1)	2017(1)
By business:			
Ferrous minerals.....	42,077	43,504	42,734
Coal	2,927	2,350	2,258
Base metals	13,738	14,349	15,243
Fertilizer nutrients(1)	—	12	8,055
Energy(2)	3,809	4,058	NA
Corporate activities	8,598	5,997	5,306
Total	71,149	70,270	73,596

(1) Discontinued operations.

(2) Consists of Biopalma employees.

	As of December 31,		
	2019(1)	2018(1)	2017(1)
By location:			
South America.....	55,641	55,423	58,457
Brazil	55,439	55,230	57,513
North America.....	6,082	6,032	6,432
Europe	308	298	375
Asia	4,455	4,475	4,571
Oceania	1,384	1,378	1,364
Africa	3,279	2,664	2,397
Total	71,149	70,270	73,596

(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, Malawi, Mozambique, New Caledonia and Oman.

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 2019, we reached a one-year agreement with the Brazilian unions providing for a salary increase of 3.5% beginning in November 2019. 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. In 2019, collective bargaining took place at our Voisey's Bay and Thompson sites. 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.

Employees within our Base 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 all new employees within our Base 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 officers*.

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, social security and labor proceedings. The most significant proceedings are discussed below. Except as otherwise noted below, the amounts claimed, and the amounts of our provisions for possible losses, are stated as of December 31, 2019. See note 28 to our consolidated financial statements for further information.

LEGAL PROCEEDINGS RELATED TO THE RUPTURE OF DAM I

We are engaged in several investigations and legal proceedings relating to the rupture of Dam I. Most of these proceedings are in early stages, and we cannot reasonably estimate the range of loss or the timing for decisions. Other proceedings or investigations relating to the rupture of Dam I are expected. Our potential liabilities resulting from the dam rupture are significant, and additional provisions are expected.

a) Public civil actions brought by the State of Minas Gerais and state public prosecutors for damages resulting from the rupture of Dam I

We are party to public civil actions brought by the State of Minas Gerais and state prosecutors claiming economic and environmental damages resulting from the dam rupture and seeking a broad range of injunctions ordering Vale to take specific remediation and reparation actions. These legal proceedings were initially brought before various state courts in Minas Gerais, but have been consolidated before the 6th Public Treasury Court in the city of Belo Horizonte and then transferred to the 2nd Public Treasury Court in the city of Belo Horizonte. In July 2019, the court decided that we are liable for the damages caused by the dam rupture, but rejected the plaintiffs' request for suspension of our activities and judicial intervention of Vale. The proceeding remains ongoing to quantify the damages.

As part of this proceeding, we entered into preliminary settlement agreements with the authorities in February 2019, as revised in November 2019, to make emergency indemnification payments to individuals, family members and business owners affected by the dam rupture. Experts appointed by the court are preparing a plan for remediation and determination of the damages. In August 2019, the court authorized us to present our plan for remediation, and determined that the measures we take and our plan of remediation be considered by the court-appointed experts in their plan for remediation and determination of the damages.

b) Public civil actions brought by state prosecutors and other authorities regarding safety requirements at other dams

We have been involved in more than twenty public civil actions in which public prosecutors and other authorities sought to suspend or restrict our operations or obtain injunctions compelling us to implement safety measures at other existing tailings dams. Nine actions in Minas Gerais were entirely dismissed following settlement agreements based on procedural matters, and seven actions were partially dismissed following settlement agreements. With respect to four actions, we are negotiating potential settlement with the authorities. Below is a summary of the key pending actions.

- In April 2019, Minas Gerais state prosecutors 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;

(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 Itabirito in April 2019. The Maravilhas II tailings dam supports our operations in the Vargem Grande complex, which have been suspended since February 2019. These proceedings were partially dismissed due to an agreement signed by the parties in September 2019. No agreement was reached with respect to the return of the dam's operations.

- In March 2019, we suspended operations at our Timbopeba mine, following a decision of a State Court in the city of Ouro Preto restraining us from using the Doutor dam and other structures at the Timbopeba mine. These proceedings were partially dismissed due to an agreement signed by the parties in September 2019 that allowed, after a period of tests, the return of Timbopeba mine's operations.
- In February 2019, the State Court in the city of Belo Horizonte ordered us to present emergency plans and documents certifying the stability and safety of dams and to suspend activities that may create risks to a number of dams used in our operations. Because we were prevented from using the Norte/Laranjeiras and the Sul dams for tailings disposal from our Brucutu mine in the Minas Centrais complex, we halted production at the Brucutu mine pending removal of the injunction. These proceedings were partially dismissed following a settlement agreement in July 2019. Brucutu mine is operational. See *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine—Impacts of the rupture of Dam I on Vale—Suspension of operations*.
- In 2018, state prosecutors brought a public civil action related to Maravilhas II and III tailings dam requesting, among others complementary requests, an injunction ordering us to refrain from disposing tailings in such dams. The injunction request was initially granted by the Court, and such decision was ultimately reversed by the Court of Appeals of the State of Minas Gerais in July 2019. This proceeding is still ongoing.
- In 2017, before the rupture of Dam I, state prosecutors of the state of Minas Gerais had 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 rupture of Dam I, the prosecutors filed a request for 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.

c) Public civil action brought by labor prosecutors

We were a party to a public civil action brought by labor prosecutors claiming, among other things, a pre-judgment attachment to secure the payment of monetary damages and costs including expert reports, wages, socio-economic relief, funeral expenses and other remediation measures to the workers affected by the rupture of Dam I.

In July 2019, we entered into a final settlement agreement with the public labor prosecutors to indemnify workers who were based at Córrego do Feijão mine or were otherwise victims of the dam rupture. The settlement agreement established standards to indemnify the families of the workers and also provides for employment stability to our employees and outsourced workers, whose workplace was the Córrego do Feijão mine on the day of the dam failure, and to the survivors who were working at the Córrego do Feijão mine at the moment of the dam failure, for the period of three years from the date of the dam

rupture, with the possibility of conversion of this stability right into the proportional amount of money that these employees and outsourced workers would have received until the date of completion of such three-year period (i.e. January 25, 2022). Spouses or companions and parents of deceased workers will be granted lifetime health insurance and children of deceased workers will be granted health insurance, until the age of 25. As of March 31, 2020, we entered into 615 indemnification agreements with individuals or groups pursuant to this settlement agreement, corresponding to 1,578 beneficiaries and 244 families of deceased workers, providing for payments in the total amount of approximately R\$1,007 million. The settlement agreement also provided for the payment of R\$400 million as collective moral damages (*danos morais coletivos*), which we fully paid in 2019. Finally, the settlement agreement determined the release of R\$1.6 billion initially blocked from us. See *Overview—Business overview—Rupture of the tailings dam at the Córrego do Feijão mine—Vale’s response—Reparation and remediation efforts*.

d) Putative class actions 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 Dam I and the adequacy of the related programs and procedures. The lead plaintiff has not specified an amount of alleged damages in these actions.

In December 2019, we made a motion to dismiss the amended complaint and, in January 2020, the lead plaintiff filed an opposition to our motion to dismiss. On February 21, 2020, we filed a reply to the opposition. We will vigorously contest these claims. 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.

e) Criminal proceedings and investigations

In January 2020, the Minas Gerais state police concluded its investigations into the causes and responsibilities for the rupture of Dam I. Based on the results of the police investigation, the state prosecutors 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, and a criminal proceeding against these individuals and Vale is ongoing. Vale intends to vigorously defend itself against the criminal claims, and we cannot estimate when a decision on this criminal proceeding will be issued.

In addition, federal prosecutors and the federal police are conducting a separate investigation into the causes of and responsibilities for the rupture of Dam I.

In September 2019, the federal police concluded an investigation on potential fraud and forgery of documents in connection with the certification of stability (Stability Condition Statement, or “DCE”) of Dam I prior to the dam rupture, and recommended that prosecutors bring criminal actions against us and some of our employees.

f) Investigation by Brazilian legislative bodies

After the rupture of Dam I, Brazilian federal and Minas Gerais state legislative bodies initiated investigations (*Comissão Parlamentar de Inquérito* or “CPIs”) and hearings into the causes of and responsibilities for the rupture of the dam and to propose changes to the existing legal and regulatory regime applicable to the mining industry and other related matters. The legislative bodies have concluded investigations on the causes of and responsibilities for the rupture of Dam I, and recommended the indictment of Vale and certain of our employees and executive officers, in addition to more stringent laws and rules regarding dam safety.

g) Cooperation with the CVM and the SEC

We have received requests from the CVM and the SEC to provide documents and other information concerning the rupture of Dam I, and we are cooperating with both agencies.

h) Other proceedings

We are a defendant in a number of investigations, arbitrations and proceedings brought by individuals, business entities, investors, associations, unions, non-governmental organizations and other entities seeking remediation and compensation for environmental, property and personal damages resulting from the Dam I rupture, including alleged violations of securities laws. These investigations, arbitrations 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 rupture of the tailings dam in Brumadinho are expected.

LEGAL PROCEEDINGS RELATED TO THE RUPTURE OF SAMARCO’S TAILINGS DAM IN MINAS GERAIS

We are engaged in several legal proceedings relating to the rupture of Samarco’s tailings dam in the city of Mariana, in the state of Minas Gerais. Most of these proceedings are in early stages, and we cannot reasonably estimate the possible loss or range of loss or the timing for a decision.

a) Public civil action filed by the Brazilian government and others and public civil action filed by the Federal Prosecution Office

In November 2015, the Brazilian federal government, the states of Minas Gerais and Espírito Santo, certain federal and state authorities and certain public entities collectively filed a public civil action before the 12th Federal Court in Belo Horizonte, state of Minas Gerais, against Samarco and its shareholders, Vale and BHPB. The plaintiffs claimed approximately R\$20.2 billion in monetary damages and a number of measures to remediate the environmental damages caused by the Fundão dam rupture.

In March 2016, we, together with Samarco and BHPB, 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 has a 15-year term, renewable for successive one-year periods until all the obligations under the Framework Agreement have been performed. The Framework Agreement does not provide for admission of civil, criminal or administrative liability for the Fundão dam rupture. The Framework Agreement provides that, within three years of the date of the agreement, the parties would review its terms to assessing the effectiveness of the ongoing remediation and compensation activities.

In May 2016, the MPF (federal prosecutors) filed a public civil action before the 12th Federal Court in Belo Horizonte against Samarco, Vale, BHPB, BNDES and the governmental authorities that are parties to the Framework Agreement. In this action, the MPF requested that the court order a broad range of specific actions to be taken by the various parties. The MPF also stated in its complaint that the required remedial measures would have a total value of R\$155 billion, based on a comparison with the costs of the Deepwater Horizon oil spill in the Gulf of Mexico in 2010. The MPF also claimed other forms of relief, including injunctions (i) ordering the defendants to implement several measures to mitigate or remediate social, economic and environmental impacts arising from the rupture of the Fundão dam, as well as other emergency measures; (ii) preventing the defendants from encumbering or disposing of their assets; (iii) preventing the defendants from paying dividends; (iv) ordering the defendants to deposit R\$7.7 billion into a fund, managed by the defendants, for implementation of social, environmental and emergency programs; (v) ordering the defendants to provide collateral in the amount of R\$155 billion to secure their compliance with the final court decision; (vi) ordering the defendants to maintain working capital in the amount of R\$2 billion initially, and thereafter in an amount equal to 100% of the expenses of the remediation and compensation measures projected for the subsequent twelve months; and (vii) ordering BNDES to take actions under its credit agreements with the defendants, including cessation of further drawings and acceleration of outstanding principal.

In June 2018, Vale, Samarco, BHPB and the offices of the federal and state (Minas Gerais and Espírito Santo) prosecutors, public defenders and attorneys general, among other parties entered into a comprehensive 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 based on the findings of experts hired by Samarco to advise the MPF over a two-year period (the June 2018 Agreement). The June 2018 Agreement terminated certain lawsuits, including public civil actions filed by the Brazilian federal government and the states of Minas Gerais and Espírito Santo. It also contemplates the future termination of other public civil actions upon agreement over the remediation programs under experts' review, and confirmed the collateral provided by the parties to secure the payment of remediation measures in the amount of R\$2.2 billion. In January 2020, the 12th Federal Court of Belo Horizonte issued an order to the Brazilian Mining Authority (ANM) confirming the revocation of the decision issued in the public civil actions filed by the Brazilian Federal Government and other plaintiffs and determined the immediate revocation of the restrictions on Vale's mining concessions.

We expect the Framework Agreement and the June 2018 Agreement to represent the first steps for the final settlement of the public civil action brought by the MPF and other related proceedings.

b) Criminal proceeding

In October 2016, the MPF filed criminal charges before the federal court of Ponte Nova, state of Minas Gerais, against us (Vale S.A.), certain of our employees and a former officer, among other corporate and individual defendants. The charges were divided into two parts. The first group of charges involves murder, physical injury and environmental crimes charges against Vale's representatives in Samarco's board and management, and various charges of environmental crimes against Vale S.A. The second group of charges includes 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. The criminal charges were accepted by the judge in November 2016, and a criminal proceeding commenced against these defendants.

In September 2019, the federal court of Ponte Nova dismissed all criminal charges relating to the first group of charges against Vale and its representatives in Samarco's board and management, but the second group of charges against Vale S.A. and one of our employees remains ongoing.

In March 2020, the judge scheduled a number of hearings to collect defense witnesses' testimonies and intent letters were issued for the same purpose. We cannot estimate when a final decision on the case will be issued.

c) Class actions in the United States

c.1) Related to Vale's American Depositary Receipts

With respect to litigation in the United States concerning Samarco's Fundão dam, we and certain of our current and former officers have been named as defendants in an action captioned *In re: Vale S.A. Securities Litigation*, No. 15 Civ. 9539 (GHW) (S.D.N.Y.). The suit was brought as a putative class action on behalf of holders of Vale's ADRs, alleging violations of the U.S. federal securities laws on the basis of alleged false and misleading statements or omissions concerning the risks of operations of Samarco's Fundão dam and the adequacy of the related programs and procedures.

On September 27, 2019, the court denied class certification. On December 26, 2019, the court issued an order stating that the parties had informed the court that they had reached a settlement in principle. On February 7, 2020, the parties submitted a motion to approve a proposed stipulation settlement agreement. On February 22, 2020, the court signed our proposed order preliminarily approving the settlement in the total amount of US\$25 million, and has also set a settlement conference for June 10, 2020 to discuss final approval of the settlement.

c.2) Related to Samarco's bonds

We were also named as defendants in an action captioned *Banco Safra S.A.—Cayman Islands Branch v. Samarco Mineração S.A., et al.*, No. 16 Civ. 8800 (RMB) (S.D.N.Y.). The suit was brought as a putative class action on behalf of holders of bonds issued by Samarco, alleging violations of the U.S. federal securities laws on the basis of alleged false and misleading statements or omissions concerning the risks of operations of Samarco's Fundão dam and the adequacy of the related programs and procedures.

In June 2019, the court dismissed the complaint. In December 2019, the plaintiff filed a notice of appeal of the decision. On March 10, 2020, the plaintiff filed its opening appeal brief. A letter with the court requesting a deadline for our brief is due by no later than March 24, 2020. We expect a due date in early June. We believe that the claims have no merit, and we will contest them.

d) Tax proceeding

In September 2018, the federal tax authorities filed a request before the 27th federal court in Belo Horizonte for an order seizing Vale's assets to secure the payment of federal tax debts of the joint venture, in the amount of approximately R\$10 billion. In May 2019, a favorable decision was issued dismissing the claim without prejudice, due to lack of procedural interest. The General Attorney of the National Treasury (PGFN) filed an appeal to the local court, and a court ruling is pending.

e) Other proceedings

Vale is a defendant in several public civil actions brought by state prosecutors of Minas Gerais and Espírito Santo, other authorities or civil associations claiming environmental damages as a result of the rupture of Samarco's dam. The relief claimed in these proceedings are generally similar to the claims brought in the public civil action brought by the Brazilian government and others and the public civil action brought by the MPF. In 2017, The Superior Court of Justice (STJ) decided that the 12th Federal Court in Belo Horizonte

is the competent court to rule on all these public civil actions. All these public civil actions have been suspended while we negotiate an agreement with the MPF, as discussed in item a) above.

Vale has 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 rupture. These proceedings include requests for significant amounts in damages, injunctions, pre-judgment attachment of assets and seizure of our bank accounts. Vale has settled part of these suits, and continues to defend itself in a number of these proceedings.

Samarco is engaged in several other investigations and proceedings claiming damages resulting from the dam rupture. Immediately after the dam rupture, the environmental authority of the state of Minas Gerais and the DNPM (currently, the ANM) commenced an investigation into the causes of the dam rupture, and ordered the suspension of Samarco's operations pending the conclusion of these investigations.

ONÇA PUMA LITIGATION

In 2012, the MPF brought a public civil action against Vale and the Brazilian state of Pará, seeking the suspension of our nickel operations in Onça Puma, in the state of Pará, due to the alleged impact on the Xikrin do Cateté and Kayapó indigenous communities located close to the mining site. The federal prosecutors contend that (i) our operations would be contaminating the water of the Catete River, which crosses the communities, (ii) we have failed to comply with certain conditions under our environmental licenses, and (iii) the state of Pará should not have granted environmental license to this operation.

Our mining activities in Onça Puma and our nickel processing plant were suspended in September 2017 and June 2019, respectively, when the Court of Appeals of the First Region (Tribunal Regional da Primeira Região) granted an injunction in favor of the federal prosecutor. We have appealed this decision and in September 2019 the Federal Supreme Court (STF) decided that Vale may resume its nickel operations at the Onça Puma mine and plant in Ourilândia do Norte (state of Pará). STF also released, in favor of the indigenous peoples, the amounts already deposited and those that will be deposited by us in a judicial account, for application under the conditions and criteria established in the Conduct Adjustment Agreement (TAC) entered between the MPF and the Xikrin and Kayapó associations.

The Onça Puma action is still ongoing, but we believe that the MPF's claims have no merit. We will continue to vigorously contest this action.

PUBLIC CIVIL ACTION SEEKING SUSPENSION OF S11D MINE

In May 2016, associations representing the indigenous community of Xikrin do Cateté brought a public civil action against Vale, the Federal Environmental Agency (IBAMA), the Federal Indigenous Agency (FUNAI) and the National Bank of Economic and Social Development (BNDES), seeking the suspension of the environmental permitting process of our S11D mine. The associations contend that FUNAI and IBAMA have failed to conduct the appropriate studies regarding the affected indigenous communities during the environmental permitting process, and consequently that the indigenous groups affected by this mine have not provided the required consent. The plaintiffs also requested a monthly payment of R\$2 million for each association until the defendants conclude the studies.

Applicable law provides for mandatory consultation with the indigenous communities located within ten kilometers of the mine, and these indigenous communities are located more than 12 kilometers away from the mine. We have submitted our preliminary defense, and in January 2017 the court denied plaintiffs' request for an injunction suspending our S11D mine.

In July 2017, the judge of the Federal Court of Marabá partially modified the previous decision and ordered that we prepare a study of the impacts of the S11D operation on the Xikrin tribe within 180 days. Vale submitted a work plan for the study to FUNAI and the plan was approved. The court then ordered us to present the work plan to the indigenous community and we are awaiting approval to continue with its preparation.

In July 2019, the expert hired to prepare the Indigenous Component Study of S11D Project, accompanied by Vale and FUNAI representatives, presented to the Xikrin tribe a work plan, which was not accepted by the indigenous people, despite being approved by FUNAI. Due to resistance by the indigenous people against the work plan, the judge of the Federal Court of Marabá ordered FUNAI to present its opinion about the plan. The judge also ordered the court experts to analyze and present their opinion about the work plan after FUNAI's response. A response from FUNAI is pending.

This decision does not affect our operations in S11D. We appealed this decision and will continue to vigorously contest this action.

PUBLIC CIVIL ACTION SEEKING SUSPENSION OF SALOBO MINE

In July 2018, associations representing the indigenous community of Xikrin do Cateté brought a public civil action against Vale, the Federal Environmental Agency (IBAMA) and the Federal Indigenous Agency (FUNAI), seeking the suspension of the environmental permitting process of Salobo Mine. The associations contend that FUNAI and IBAMA have failed to conduct the appropriate studies regarding the affected indigenous communities during the environmental permitting process and contends that our operations would be contaminating the water of the Itacaiúnas River and consequently that the indigenous groups affected by this mine have not provided the required consent. The plaintiffs also requested a monthly payment of R\$2 million for each association until the defendants conclude the studies.

Applicable law provides for mandatory consultation with the indigenous communities located within ten kilometers of the mine, and these indigenous communities are located more than 22 kilometers away from the mine. In October 2017 the court denied plaintiffs' request for an injunction suspending our Salobo Mine.

In February 2019, Vale, IBAMA, and the environmental agency Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) filed a joint answer in court, rebutting the plaintiff's claims, and reaffirming the legality of the environmental permitting process of Salobo Mine and the fulfillment of all conditions imposed by relevant authorities. In March 2019, the MPF presented an opinion for the suspension of the activities in the Salobo Mine. A decision by the federal court is pending.

In July 2019, the Judge of the Federal Court of Marabá partially granted an injunction requested by the Indigenous Associations, ordering Vale and Salobo to prepare the Indigenous Component Study of the Salobo Mine project, and rejected all other requests filed by the plaintiff, including project shutdown and monthly fund payments.

In December 2019, in accordance with the procedure established in the legislation for the preparation of indigenous component studies, we presented the curriculum of the professionals who will prepare such

study, as well as the work plan for the acknowledgement and approval by FUNAI. A response from FUNAI is pending.

The decision held by the Federal Court of Marabá does not affect our operations in Salobo mine. We appealed this decision and will continue to vigorously contest this action.

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, 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\$5.673 billion. An expert report favorable to Vale has been issued, but the court granted the municipality's request for additional expert evidence. The preparation of this additional expert evidence is pending. Both parties agreed to suspend the action until the presentation of an expert report, and to reconvene to discuss a potential settlement after such expert report is presented.

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\$6.7 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 Vale's 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 we had employees in conditions similar to slavery. We appealed this decision and will continue to vigorously contest this action.

ENVIRONMENTAL CRIMINAL PROCEEDING IN MARANHÃO

In February 2019, the state prosecutors of the state of Maranhão commenced an environmental criminal proceeding against Vale S.A. and certain of our former executive officers before a criminal court in the city of São Luis, for alleged discharges of iron ore particles in the atmosphere. The conducts alleged by the prosecutors occurred in 2011. We submitted our preliminary defense in April, 2019, and a decision of the court on the admissibility of this criminal proceeding is pending. If the court rejects our preliminary defense, we will submit our defense on the merits of the case. If we are eventually convicted in this

proceeding, we may be required to pay fines. This proceeding is in an early stage, and we cannot reasonably estimate the timing for a decision on the merits. We will continue to vigorously contest this action.

TAX PROCEEDINGS

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 out of a large number of assessments by the DNPM (currently, the ANM), which main discussions involve the deduction of insurance and transportation costs indicated in the corresponding invoice payment of royalties on pellet sales and CFEM charges on the revenues provided by our subsidiaries abroad. The aggregate amount claimed in the pending assessments is approximately R\$11.2 billion, including interest and penalties through March 31, 2020.

We are contesting these claims using the available avenues under Brazilian law, beginning with challenges in administrative tribunals and proceeding with challenges in the judicial courts. We have received some favorable and unfavorable decisions, and we cannot predict the amount of time required before final judicial resolutions.

The agency's assessments initially covered a period of up to 20 years before their issuances, based on the interpretation that the applicable statute of limitation for CFEM claims would be 20 years. We challenged all the assessments contending that these claims are subject to a 5-year statute of limitation. In December 2015, the Attorney General's Office issued a legal opinion concluding that CFEM claims are subject to a 10-year statute of limitations. This conclusion is consistent with the decisions of the Superior Court of Justice ("STJ"), and we expect that the ANM and the courts will exclude charges that are time barred under this legal opinion.

b) ICMS tax assessments and legal proceedings

We are engaged in several administrative and court proceedings relating to additional charges of value-added tax on services and circulation of goods (ICMS) by the tax authorities of different Brazilian states. In each of these proceedings, the tax authorities claim that (i) certain credits we have deducted from our payments of ICMS were not deductible; (ii) we have failed to comply with certain accessory obligations; (iii) we are required to pay the ICMS on electricity purchases and (iv) we are required to pay ICMS in connection with goods that we bring into the State of Pará. We estimate our possible losses resulting from these proceedings to be R\$3.057 billion.

The tax authorities of the State of Minas Gerais contend that we should have paid ICMS in relation to the costs of transportation of iron ore, but we understand that ICMS is not applicable to this activity because the ore was transported directly by us. In December 2018, the judicial court definitively decided in our favor with respect to the tax assessment covering activities in 2009 and 2010 in an aggregate amount of R\$632 million. With respect to activities in 2011, 2012 and 2013, the amount in dispute is R\$1 billion (included in the possible losses mentioned above). We also expect a favorable outcome in this case.

In connection with a legal proceeding relating to ICMS, prosecutors in the state of Rio de Janeiro are seeking criminal charges against members of management of our subsidiary MBR, alleging tax fraud. The defense has presented its case in the criminal proceeding against these individuals and a decision is

pending. The case has been extinguished for one of the members of management of our subsidiary MBR, but remains pending for the others. We believe that these allegations are without merit.

c) Litigation on Brazilian taxation of foreign subsidiaries

We are engaged in legal proceedings concerning the contention of the Brazilian federal tax authority (*Receita Federal*) that we should pay Brazilian corporate income tax and social security contributions on the net income of our non-Brazilian subsidiaries and affiliates.

In 2013, we significantly reduced the amount in dispute by participating in the REFIS, a federal tax settlement program for payment of amounts relating to Brazilian corporate income tax and social contribution. We settled the claims related to the net income of our non-Brazilian subsidiaries and affiliates from 2003 to 2012, and we continue to dispute the assessments with respect to 1996 to 2002. Under the REFIS, we paid R\$5.9 billion in 2013, and we agreed to pay 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. On December 31, 2019, the SELIC rate was 4.5% per annum (as compared to 6.5% per annum on December 31, 2018). As of December 31, 2019, the remaining balance was R\$15.334 billion, to be paid in 106 further installments.

In December 2019, the total amount in dispute for the period between 1996 and 2002 was R\$2.3 billion. The tax authorities agreed to a reduction of such amount to approximately R\$900 million, based on a decision by the Federal Supreme Court (STF), and we have requested the cancellation of the entire debt. A decision by the court is pending.

We had initiated a direct legal proceeding (*mandado de segurança*) in 2003 challenging the tax authority's position. In December 2013, as required by the REFIS statute, we waived the legal arguments with respect to the period between 2003 and 2012. We are continuing our direct legal proceeding with respect to the years not included in the REFIS. In 2014, the Superior Court of Justice (STJ) ruled in our favor on certain of our arguments against those assessments. The tax authorities filed an appeal before the Federal Supreme Court (STF) and a decision is pending.

d) Assessments and legal proceedings related to PIS/COFINS

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, which may be partially offset by credits resulting from PIS and COFINS payments made by our suppliers. The tax authorities claim that (i) some credits we have deducted from our payments of PIS and COFINS were not deductible and (ii) we have not submitted adequate evidence of certain other credits. We are contesting these assessments in the administrative and judicial levels. The total amount in dispute is R\$5.4 billion as of December 31, 2019, including disputes involving Vale's subsidiaries and divested companies for which we remain liable for taxes prior to divestment.

e) Income tax litigation

In 2004, a decision of the Brazilian Superior Court of Justice (STJ) granted us the right to deduct the amounts we pay as social security contributions on the net income (CSLL) from our taxable income. The effects of the CSLL deducted from our taxable income between 2003 and 2019 was approximately R\$8 billion, as adjusted by the Brazilian Central Bank's base interest rate (SELIC) and without penalties. In 2006, the Brazilian federal tax authorities commenced a rescission action (*ação rescisória*) against us, seeking the reversal of the 2004 decision. The rescission action was rejected by the Federal Court of

Appeals (TRF) of the Second Region. The tax authorities appealed to the Superior Court of Justice (STJ) and to the Federal Supreme Court (STF), and the STJ determined that the TRF had not properly considered one of the questions raised by the federal government, and remanded the case for further decision of the TRF. In November 2019, the TRF decided for the reversal of the 2004 decision, and therefore, we decided to not deduct the CSLL from our taxable income for the years ending after December 31, 2019. We have filed a motion for clarification before the TRF and requested the suspension of the effects of the 2019 determination, and a judicial decision is pending.

f) Fines on the undue deduction of tax credits

We have received multiple assessments from the Brazilian federal tax authority imposing fines due to allegedly undue deduction of tax credits from our payments of income tax and contributions on the net income (CSLL).

In these cases, the tax authority challenged our right to set off certain tax credits and issued assessments imposing fines in the amount of 50% of the amount that was unduly deducted. As of December 31, 2019, the total amount of fines imposed under these assessments were R\$1.5 billion, and new assessments are expected. We are challenging these assessments in administrative proceedings. These assessments cover only the fines resulting from the allegedly undue deductions, as the principal amount of unpaid taxes, interest and other penalties for late payment are being discussed in separate administrative proceedings. If we succeed in these separate administrative proceedings, the corresponding fines are expected to be cancelled. The legal grounds for these fines are currently being discussed by another company before the Federal Supreme Court (STF), and a favorable decision to this other company will be applicable to other taxpayers, including us.

g) Transfer pricing tax assessment

In November 2019, we received a tax assessment charging corporate income tax (IRPJ) and social contributions on the net income (CSLL) for the fiscal years of 2015 and 2016 due to allegedly unwarranted deduction of intermediation costs from the calculation of the transfer pricing over the exportation of iron, copper and manganese to its foreign controlled company in the 2015 and 2016 fiscal years. We may receive similar tax assessments for other fiscal years. As of December 31, 2019, the total amount in dispute is R\$ 1.4 billion for the fiscal year of 2016 as well as the reduction of the tax losses in 2015 and 2016 in the amount of R\$ 3.271 billion and R\$900 million, respectively. We have challenged this assessment in all respects and an administrative decision is pending.

UPDATES ON OTHER PROCEEDINGS

As reported in our annual report on form 20-F for prior years, we are a party to a proceeding relating to environmental investigation in connection with our activities at the Tubarão port. In 2018, we entered into a settlement agreement with the MPF, state prosecutors and the environmental and water authority of the state of Espírito Santo (IEMA), pursuant to which we agreed to take additional measures to prevent or mitigate the release of iron ore in the sea. In the event that we fail to comply with the agreement, the relevant authorities may resume the investigative proceedings and take additional measures against us.

MEMORANDUM AND ARTICLES OF ASSOCIATION

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

Pursuant to Brazilian corporate law, non-controlling shareholders holding common shares representing at least 15% of a company's voting capital have the right to appoint one member and an alternate to the board of directors. If no group of common shareholders meets this threshold, holders of golden shares may combine their holdings with those of holders of common shares, to reach at least 10% of the total

share capital in order to appoint one member and an alternate to the Board of Directors. Non-controlling holders of common shares may also elect one member of the Fiscal Council and an alternate, pursuant to applicable CVM rules. Holders of the golden shares may elect one member of the permanent Fiscal Council and the respective alternate.

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, minority shareholders representing at least 10% of the company's voting capital have the right to demand that a cumulative voting procedure be adopted to entitle each common share to as many votes as there are board members and to give each common share the right to vote cumulatively for only one candidate of our board of directors or to distribute its votes among several candidates. Pursuant to regulations promulgated by the CVM, the 10% threshold requirement for the exercise of cumulative voting procedures may be reduced depending on the amount of capital stock of the company. For a company like us, the threshold is 5%. Thus, shareholders representing 5% of our voting capital may demand the adoption of a cumulative voting procedure.

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, if necessary, 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, this notice to shareholders is required to be published no fewer than three times, in the *Diário Oficial do Estado do Rio de Janeiro* and in a newspaper with general circulation in the city where we have our registered office, in Rio de Janeiro—*Valor Econômico—Estado do Rio de Janeiro* is the newspaper currently designated 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 as otherwise provided, including 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 as 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 chairman or, in case of his absence, by the vice-chairman of our Board of Directors. In the case of temporary impediment or absence of the chairman or vice-chairman of the Board of Directors, the shareholders' meetings may be chaired by their respective alternates, or in the absence or impediment of such alternates, by a director or other person especially appointed by the chairman 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.

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.

The 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 prescribe that we must 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 inadvisable in light of our financial condition. To date, our Board of Directors has never determined that payment of the mandatory dividend was inadvisable. 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—Memorandum and articles of association—Common shares and golden shares—Calculation of distributable amount*.

Distributions classified as shareholders' 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*, or 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.

SHAREHOLDER DEBENTURES

At the time of the first stage of our privatization in 1997, we issued shareholder revenue interests 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 shareholder debentures US\$195 million in 2019, US\$148 million in 2018 and US\$147 million in 2017. See note 13 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 depository 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 depository 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 depository with respect to the ADSs. Pursuant to this electronic registration, the custodian and the depository 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

Exchange Controls and Other Limitations Affecting Security Holders

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-Brazilian 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-Brazilian Holder. Therefore, Non-Brazilian 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, 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 tax benefit to the Company in the case 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-Brazilian 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-Brazilian Holder.

Investors identified in items (i) or (ii) are subject to favorable tax treatment, as described below.

Capital gains realized by a Non-Brazilian 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-Brazilian 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-Brazilian 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-Brazilian Holder on the disposition of ADSs. Consequently, gains on a disposition of ADSs by a Non-Brazilian Holder (whether in a transaction carried out with another Non-Brazilian 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 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-Brazilian Holder;
- the method by which such Non-Brazilian 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.

Through December 31, 2019, any gain realized by a Non-Brazilian Holder on a sale or disposition of common shares carried out on the Brazilian stock exchange was:

- exempt from income tax where the Non-Brazilian 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-Brazilian Holder either (A) (i) is not a 4,373 Holder and (ii) is not resident or domiciled in a Low Tax Jurisdiction or (B) (i) is a 4,373 Holder and (ii) is resident or domiciled in a Low Tax Jurisdiction; or
- subject to income tax at a rate of 25% where the Non-Brazilian Holder (i) is not a 4,373 Holder and (ii) is resident or domiciled in a Low Tax Jurisdiction.

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.

Beginning on January 1, 2017, the taxation regime for capital gains in Brazil was significantly amended. Under the new regime, capital gains realized by non-Brazilian residents and individuals resident in Brazil are subject to income tax at progressive rates ranging from 15% to 22.5%, where the Non Brazilian Holder either (A)(i) is not a 4,373 Holder and (ii) is not resident or domiciled in a Low Tax Jurisdiction, or (B)(i) is a 4,373 Holder and (ii) 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-Brazilian 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-Brazilian 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-Brazilian 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-Brazilian Holder, except for gift and inheritance taxes

which are levied by some states of Brazil on gifts made or inheritances bestowed by a Non-Brazilian 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 ADSs.

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,
- 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 capital 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.

Subject to certain exceptions for short-term and hedged positions, 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.” 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 2018 or 2019 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 2020 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 restrictions, 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. You must satisfy minimum holding period requirements to be eligible to claim a foreign tax credit for Brazilian taxes withheld on dividends. The limitation on foreign taxes eligible for credit is calculated separately for specific categories of income. For this purpose dividends paid by us on our common shares or ADSs will generally constitute “passive income.” Foreign tax credits may not be allowed for withholding taxes imposed in respect of certain short-term or hedged positions in securities or in respect of arrangements in which a U.S. holder’s expected economic profit is insubstantial. 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. 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.

Any gain or loss generally will be U.S. source gain or loss for U.S. foreign tax credit purposes. Consequently, if a Brazilian withholding tax is imposed on the sale or disposition of ADSs or common shares, and you do not receive significant foreign source income from other sources, you may not be able to derive effective U.S. foreign tax credit benefits in respect of such Brazilian withholding tax. 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 U.S.\$50,000 on the last day of the taxable year or U.S.\$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 U.S. \$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 foreign 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.

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, 2019. 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 our disclosure controls and procedures 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. 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, 2019 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, 2019. The effectiveness of our internal control over financial reporting as of December 31, 2019 has been audited by PricewaterhouseCoopers Auditores Independentes, an independent registered public accounting firm, as stated in their report which appears herein.

The adoption of IFRS 16 (Leases) required the implementation of new controls and the modification of certain accounting processes related to leases. Our management identified no other changes in our internal control over financial reporting that occurred during our fiscal year ended December 31, 2019 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 (IBGC), as required by Brazilian regulations. The code is based on the “comply or explain” principle, and we currently fully comply with 77% of the practices recommended by the IBGC and partially comply with 10% 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 do not have a majority of independent directors. At least 20% of our board of directors is composed of independent directors, as required under Novo Mercado listing rules and our bylaws.
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.
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 do not have a nominating/corporate governance committee. However, we do have a Personnel and Governance Committee and a Compliance and Risk Committee, which are advisory committees to the Board of Directors (which may include members who are not directors) with written charters that cover similar specified duties.</p> <p>According to its charter, the Personnel and Governance Committee is responsible, among other matters, for:</p> <ul style="list-style-type: none"> • supporting the Board of Directors in the process of selecting and appointing the Chief Executive Officer, and evaluating the appointment, by the latter, of the other members of the Executive Board and other leaders who report directly to the Chief Executive Officer; • supporting the Board of Directors in the elaboration and maintenance of a Nomination Policy applicable to Directors and Officers, and also to other leaders who report directly to the Chief Executive Officer, in accordance with legal requirements and best corporate governance practices; • evaluating the company's human resources general policies as submitted by the Executive Board to the Board of Directors; • preparing a Recruitment Policy for choosing Vale's leadership, in line with applicable leadership requirements and corporate governance best practices;

Section NYSE corporate governance rule for U.S. domestic issuers

Our approach

- monitoring the development of the succession plan for the Executive Board and other leaders who report directly to the Chief Executive Officer, as well as their successors and proposing improvements;
- periodically evaluating and recommending adjustments to corporate governance best practices concerning the structure, size and composition of the Board of Directors and the Advisory Committees, as well as the balance of experiences, knowledge and diversity of the profiles and style of leadership of their members, based on market research and evaluations by institutions and external consultants;
- identifying and recommending potential candidates for the Board of Directors to be submitted by the Board of Directors at the Ordinary General Shareholders' Meeting, and also recommending potential candidates to be members of the Advisory Committees, including eventual substitutions and vacancy cases;
- supporting the Chairman of the Board of Directors in organizing the process for performance evaluation of the Board of Directors and Advisory Committees;
- evaluating proposals for modifying the corporate governance documents, such as the By-Laws, the Code of Conduct and Internal Rules of Vale's Advisory Committees and Board of Directors, in addition to other policies and documents which are not the responsibility of other committees;
- promoting, monitoring and ensuring the development and efficacy of the Vale's governance model, assuring that all initiatives are in line with best practices and are in synergy;
- annually reviewing and recommending the necessary changes to improve Vale's corporate governance;
- evaluating and monitoring updates related to current norms, regulations and recommendations, in addition to practices and market trends that may impact our activities regarding corporate governance; and
- Despite not formally provided for in the charter of the Personnel and Governance Committee, the organ has also as responsibility to perform the role as Nomination Committee until 2021, when a specific committee will be set up for this purpose.

According to its charter, the Compliance and Risk Committee is responsible, among other matters, for:

- ensuring the adoption and improvement of good practices of compliance and integrity, including evaluating events of potential conflicts of interest; and
- monitoring the scope of activities and effectiveness of the departments in charge of our corporate governance, compliance, corporate integrity, risk management and controls and proposing improvements

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
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>These committees' charters allow for the inclusion of one independent member. For this purpose, an independent member is a person who:</p> <ul style="list-style-type: none"> ● Has no current link to Vale, except for membership on an Advisory Committee or a non-material shareholding in our share capital or investment in our bonds, and is not financially dependent on compensation from us; ● Has not been an employee of the Company (or of its subsidiaries) or of a direct or indirect controlling shareholder, or a representative of any direct or indirect controlling shareholder for, at least, three years; ● Does not provide, purchase or offer (trade), directly or indirectly, services and/or products to us on a scale that is material to that person or to us; ● Is not linked to a controlling shareholder, member of the controlling group or of another group with material shareholding, the spouse or relative up to the second degree of the foregoing, or connected to entities related to a controlling shareholder; ● Is not a spouse or relative up to the second degree of any officer or manager of Vale; ● Has not been a partner, in the past three years, of an auditing firm that audits or has audited Vale in this same period; and ● Is not a member of a non-profit entity that receives significant financial funds from us or from our related parties. <p>We do not have a compensation committee.</p> <p>However, we have a Personnel and Governance Committee, which is an advisory committee to the Board of Directors (which may include an independent member who is not a director). This committee is responsible for:</p> <ul style="list-style-type: none"> ● evaluating Vale's general human resources policies as submitted by the Executive Board to the Board of Directors; ● evaluating and adjusting the compensation model of members of the Executive Board; and ● aiding the Board of Directors in setting and monitoring goals for the performance evaluation of the Executive Board and other leaders who report directly to the Chief Executive Officer, and of those in charge of Vale's Governance Office.

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
303A.06 303A.07	A listed company must have an audit committee with a minimum of three independent directors who satisfy the independence requirements of Rule 10A-3 under the Exchange Act, with a written charter that covers certain minimum specified duties.	<p>We do not have an audit committee with three independent members who satisfy the independence requirements of Rule 10A-3 under the Exchange Act. In lieu of appointing an audit committee composed of independent members of the Board of Directors, we have established an Audit Committee that complies with the listing rules of the Novo Mercado segment of B3 (the Brazilian Stock Exchange). Our Audit Committee meets the requirements for the exemption under Exchange Act Rule 10A-3(c)(3).</p> <p>Under our bylaws and the Audit Committee's charter, and pursuant to the Novo Mercado listing rules, our Audit Committee shall have between three and five members. In addition, (i) all the members of our Audit Committee must comply with the independence requirements of the Novo Mercado listing rules, (ii) at least one of the members of our Audit Committee must be an independent member of the Board of Directors, (iii) at least one of the members of our Audit Committee must not be a member of the Board of Directors or any other of our corporate bodies, and (iv) at least one of the members of our Audit Committee must satisfy audit/financial expertise requirements of the CVM. The requirement of audit/financial expertise may be satisfied by the same person that satisfies the requirements described items (ii) or (iii) above.</p> <p>The responsibilities of the Audit Committee are set forth in its charter. Under our bylaws, the charter must give the Audit 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 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 protect a whistleblower's identity and the confidentiality of the information; • 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

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.	<ul style="list-style-type: none"> mediating disagreements between management and the independent auditors regarding the company's financial statements, problems or difficulties found by the auditors during the audit process, and disagreements with management regarding accounting principles and related matters.
303A.09	A listed company must adopt and disclose corporate governance guidelines that cover certain minimum specified subjects.	We have not published formal corporate governance guidelines.
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 formal code of conduct, which applies to our directors, officers and employees. 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.
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 our employees and to the members of our Board of Directors and our Board of Executive Officers, including the chief executive officer and the chief financial officer. We have posted the Code of Conduct on our website, at: <http://www.vale.com> (under English Version/Investors/Corporate Governance/Policies). Copies of our Code of Conduct may be obtained without charge by writing to us at the address set forth on the front cover of this Form 20-F. 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.

Allegations presented to our Whistleblower Channel are communicated to Vale's Ethics and Conduct Office, an independent department reporting directly to the Board of Directors and responsible for handling complaints as well as disseminating Vale's Code of Conduct. In 2019, Vale's Board of Directors approved an updated version of the Code of Conduct, which is available in 8 languages.

Allegations are investigated by the Ethics and Conduct Office, except in the event of (i) lack of information to initiate an examination, in which case the Office will request additional information to the person raising the concern and will proceed with the investigation provided it receives additional information within 15 days, and (ii) lack of pertinence to the Ethics and Conduct Office's scope of work. The Ethics and Conduct Office's scope of work includes not only alleged violation of Vale's Code of Conduct, such as fraud and moral harassment cases, but also the resolution of issues that have not been properly addressed by other lines of reporting in the company, such as delay in payments to contractors.

In 2019, our Whistleblower Channel received 3,507 complaints and closed 3,382 cases, of which (i) 291 referred to complaints that were not investigated due to lack of information or pertinence to the scope of the Ethics and Conduct Office, (ii) 154 were consultations, which were answered by the Ethics and Conduct Office, but did not lead to an investigation, and (iii) 2,937 lead to investigations, that confirmed violations of Vale's Code of Conduct in 38% of these cases. All confirmed violations triggered correction plans, which are presented by company's managers and approved by the Ethics and Conduct Office. 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 the Ethics and Conduct Office in 2019 resulted in 1,833 corrective actions, including the termination of 227 employees.

After the rupture of Dam I, the Ethics and Conduct Office was one of the channels made available for the population to request information and support from Vale. Contacts related to this event amounted to 983 additional inquiries, not included in the above-mentioned numbers. Communications received by the Ethics and Conduct Office in connection with the rupture of Dam I were mainly to: (i) report missing persons (42%), (ii) offer voluntary work (26%), (iii) inform potential victims were safe (8%), (iv) request indemnification (5%) and (v) offer donations (3%).

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 ("PwC") in 2019 and KPMG Auditores Independentes ("KPMG") for professional services in 2018:

	Year ended December 31,	
	2019	2018
	(US\$ thousand)	
Audit fees	6,144	4,490
Audit-related fees	6	15
Other fees	—	13
Total fees	<u>6,150</u>	<u>4,518</u>

"Audit fees" are the aggregate fees from KPMG and 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 KPMG and 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."

On September 27, 2018, our Board of Directors appointed PwC as our principal accountant, in replacement of KPMG, for the provision of audit services for a period of five years. PwC was engaged in the first quarter of 2019. The amounts reported for the year of 2019 do not include amounts paid to KPMG.

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

Exhibit Number

1	Bylaws of Vale S.A., as of April 30, 2019
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 Espirito 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)
8	List of subsidiaries
10.24	Shareholders' Agreement, dated August 14, 2017, among Litel Participações S.A., Litela Participações S.A., Bradespar S.A., Mitsui & Co., Ltd. and BNDES Participações S.A.—BNDESPAR incorporated by reference to the current report on Form 6-K furnished to the Securities and Exchange Commission on August 15, 2017 (File No. 001-15030, Accession No. 0001104659-17-051910)
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
15.2	Consent of KPMG Auditores Independentes
101	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 Vale's 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.
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.
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.
Lower Class 1	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.
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 resource(s)	A concentration or occurrence of minerals of economic interest in such form and quantity that could justify an eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a mineral resource are known, estimated or interpreted from specific geological evidence through drill holes, trenches and/or outcrops. Mineral resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured Resources.

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 komatite.
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 coals 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 (indicated) reserves	Reserves for which quantity and grade and/or quality are computed from information similar to that used for proven (measured) reserves, but the sites for inspection, sampling and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.
Proven (measured) reserves	Reserves for which (i) quantity is computed from dimensions revealed in outcrops, trenches, working or drill holes; grade and/or quality are computed from the results of detailed sampling and (ii) the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established.
Real, reais or R\$	The official currency of Brazil is the <i>real</i> (singular) (plural: <i>reais</i>).
Reserves (ore/mineral)	The part of a mineral deposit that could be economically and legally extracted or produced at the time of the reserve determination.
ROM	Run-of-mine. Ore in its natural (unprocessed) state, as mined, without having been crushed.
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.
Underground mining	Mineral exploitation in which extraction is carried out beneath the earth's surface.
Upper Class 1	High purity nickel, containing lower levels of deleterious elements, that is used in high premium applications (e.g., 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/ LUCIANO SIANI PIRES

Name: Luciano Siani Pires

Title: Chief Financial Officer

Date: April 3, 2020

Vale S.A. Financial Statements

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of
Vale S.A.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated statement of financial position of Vale S.A. and its subsidiaries (the "Company") as of December 31, 2019, and the related consolidated income statement, statement of comprehensive income, statement of changes in equity and statement of cash flows for the year then ended, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control—Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2019, and the results of its operations and its cash flows for the year then ended in conformity with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standards Board (IASB). Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control—Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As discussed in Notes 2 (d) and 19 to the consolidated financial statements, the Company changed the manner in which it accounts for leases on January 1, 2019.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.



Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's 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. A company's 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 as necessary 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 the company's 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 effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the fiscal council and that (i) relate to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating, the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Brumadinho's dam failure

As described in Note 3 to the consolidated financial statements, the Company has incurred costs and recorded provisions, as a consequence of the Brumadinho's Dam failure, which led to a total impact of US\$ 7,402 million recognized in the income statement of the year ended December 31, 2019. Management applied significant

judgment in determining the value of these provisions, which involved the use of significant estimates and assumptions with respect to: (i) the engineering projects and the total expected costs to carry out all de-characterization projects related to the dams built under the upstream method; and (ii) the valuation of the costs to carry out the remediation of the environmental and social impacts of the event in accordance with the agreements reached and under negotiation with the relevant authorities and others. The assumptions used in developing these estimates, with the support of management's specialists, included among others (i) volume of the waste to be removed based on historical data available; (ii) interpretation of the enacted laws and regulations; (iii) location availability for the tailings disposal; (iv) acceptance by the authorities of the proposed engineering methods and solutions; and (v) amount of indemnification payments to those affected by the Brumadinho's Dam failure. In addition, as management has further disclosed, given the nature and uncertainties inherent in this type of event, the amounts recognized and disclosed will be reassessed by the Company and may be adjusted significantly in future periods, as new facts and circumstances become known.

The principal considerations for our determination that performing procedures relating to the Brumadinho's Dam failure provisions is a critical audit matter are there were significant judgments by management, including the use of specialists, when developing the estimates of (i) the engineering projects and the total expected costs to carry out all de-characterization projects related to the dams, and (ii) valuation of the costs related to the agreements entered and under negotiation by the Company. This in turn led to a high degree of auditor judgment, subjectivity, and effort in performing procedures to evaluate management's valuation and significant assumptions used. In addition, the audit effort involved the use of professionals with specialized skill and knowledge to assist in evaluating the audit evidence obtained from at these procedures.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to management's estimates of cost and provision recorded in relation to the Brumadinho's Dam failure. These procedures also included, among others, evaluating the methods and significant assumptions used by management in developing these estimates and cost provisions, and the assessment of future costs in accordance with the agreements reached and under negotiation, and whether these were consistent with internal and external evidence available or obtained in other areas of the audit. The work of management's specialists was used in performing the procedures to evaluate the reasonableness of these estimates. As a basis for using this work, the specialists' qualifications and objectivity were understood, as well as the methods and assumptions used by the specialists. The procedures also included tests of the data used by the management's specialist and an understanding of the specialists' findings. In addition, professionals with specialized skill and knowledge were used to assist in evaluating the reasonableness of the assumptions used in the engineering projects set out by management.

Assessment of impairment for long-lived non-financial assets

As described in Note 20 to the consolidated financial statements, the Company's management performs on an annual basis an impairment test of goodwill, as well as evaluates impairment indicators for the long-lived non-financial assets, such as intangible, property plant and equipment and investments in associate companies and joint ventures. Potential impairment is identified by management when comparing the higher of the fair value less costs to disposal ("FVLCD") of a cash-generating unit ("CGU") to its carrying value, including goodwill. Fair value less cost of disposal is estimated by management using a discounted cash flow techniques. As part of this assessment, the Company estimates future cash flows expected to arise from the continued use of each CGU from a market



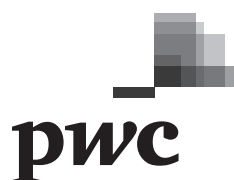
participant's perspective, including any expansion prospects, considering different internal and external factors, as well as significant judgments and assumptions relating to (i) mineral reserves and mineral resources measured by management's specialists; (ii) costs and capital investments; (iii) long-term future metal prices; (iv) future production volumes; and (v) discount rates. During 2019, the Company has carried out an impairment test for the coal business and for the New Caledonian business, which led to an impairment charge of US\$ 1,691 million and US\$ 2,511 million, respectively.

The principal considerations for our determination that performing procedures relating to impairment tests for long-lived non-financial assets is a critical audit matter are there were significant judgments by management when developing the FVLCD of each CGU, including the use of specialists when developing the estimates of mineral reserves and mineral resources. This in turn led to a high degree of auditor judgment, subjectivity, and effort in performing procedures to evaluate management's cash flow projections and significant assumptions, including long-term future metal prices, future production volumes, discount rates and mineral reserves and mineral resources. In addition, the audit effort involved the use of professionals with specialized skills and knowledge to assist in performing these procedures and evaluating the audit evidence obtained.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of the controls related to management's long-lived non-financial assets impairment assessment and calculation of the FVLCD for each CGU. These procedures also included, among others, evaluating the appropriateness of the discounted cash flow model, testing management's process for developing the fair value estimate; testing the completeness and accuracy of the underlying data used in the model and evaluating the significant assumptions used by management. Evaluating these significant assumptions involved evaluating whether the assumptions used by management were reasonable considering: (i) the current and past performance of each CGU; (ii) the consistency with external market and industry data; and (iii) whether these assumptions were consistent with evidence obtained in other areas of the audit. The work of management's specialists was used in performing the procedures to evaluate the reasonableness of the mineral reserves and mineral resources. As a basis for using this work, the specialists' qualifications and objectivity were understood, as well as the methods and assumptions used by the specialists. The procedures also included tests of the data used by the specialist and an evaluation of the specialists' findings. In addition, professionals with specialized skills and knowledge were used to assist in the evaluation of the appropriateness of the Company's discounted cash flow model, the reasonableness of the long-term future metal prices and the discount rate.

Tax litigation

As described in Note 28 to the consolidated financial statements, the Company has recorded provision for tax litigations of US\$ 696 million and has disclosed contingent liabilities related to tax litigation of US\$ 8,395 million. The Company recognizes a provision for tax litigation in the consolidated financial statements for the resolution of pending litigation when the Company has a present obligation as a result of a past event and management determines that a loss is probable, and the amount of the loss can be reasonably estimated, with the support of management's specialists. No provision for tax litigation is recognized in the consolidated financial statements for unfavorable outcomes when, after assessing the information available, (i) management concludes that it is not probable that a loss has been incurred in any of the pending litigation; or (ii) management is unable to estimate the loss or range of loss for any of the pending matters. In case of income tax pending litigations, management



determines whether it is probable or not that taxation authority will accept the uncertain tax treatment. If the Company concludes it is not probable that taxation authority will accept the uncertain tax treatment, a provision for income tax is recognized. The Company also discloses the contingency in circumstances where management concludes (i) no loss is probable or reasonably estimable, but it is reasonably possible that a loss may be incurred or, (ii) in case of income tax pending litigations, it is probable that the taxation authority will accept the uncertain tax treatment.

The principal considerations for our determination that performing procedures relating to tax litigation are a critical audit matter are there were significant judgments by management when assessing the likelihood and magnitude of a provision and when determining whether a reasonable estimate of the loss or range of loss and possible outcomes for each tax litigation claim can be made, including the use of management's specialists. This, in turn, led to a high degree of auditor judgment, subjectivity and effort in evaluating management's assessment of the loss contingencies associated with tax litigation claims. In addition, the audit effort involved the use of professionals with specialized skills and knowledge to assist in performing these procedures and evaluating the audit evidence obtained.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to management's evaluation of tax litigation claims, including controls over determining whether a loss is probable and whether the amount of loss can be reasonably estimated, or whether it is probable the taxation authority will not accept the income tax pending litigation, as well as financial statement disclosures. These procedures also included, among others, obtaining and evaluating the letters of audit inquiry with internal and external legal counsel, evaluating the reasonableness of management's assessment regarding unfavorable outcomes and evaluating the sufficiency of the Company's tax litigation contingencies disclosures. The work of management's specialists was used in performing the procedures to evaluate the reasonableness of the estimates related to the tax litigation claims. As a basis for using this work, the specialists' qualifications and objectivity were understood, as well as the methods and assumptions used by the specialists. The procedures also included an evaluation of the specialists' findings. In addition, professionals with specialized skills and knowledge were used to assist in the evaluation of the reasonableness of the estimate or range of loss and possible outcomes the main tax litigation claims.

/s/ PricewaterhouseCoopers Auditores Independentes
Rio de Janeiro, RJ, Brazil
February 20, 2020, except for notes 3 (f.iii) and 34 to
the consolidated financial statements, as to which the
date is April 3, 2020.

We have served as the Company's auditor since 2019.



KPMG Auditores Independentes
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Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors of
Vale S.A.

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated statement of financial position of Vale S.A. and its subsidiaries (the "Company") as of December 31, 2018, the related consolidated income statement and statements of comprehensive income, changes in equity and cash flows for each of the years in the two-year period ended December 31, 2018, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018, and the results of its operations and its cash flows for each of the years in the two year period ended December 31, 2018, in conformity with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standards Board.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Emphasis of matter—Subsequent Event

We draw attention to Note 3 to the consolidated financial statements of the Company, which describes the Brumadinho dam failure which occurred at the Company's operating facilities on January 25, 2019. The Company's management considered that the event is not a condition that existed at the end of the reporting period, and therefore did not require adjustments to the financial statements as of December 31, 2018.

/s/ KPMG Auditores Independentes

KPMG Auditores Independentes

We served as the Company's auditor from 2014 to 2018.

Rio de Janeiro, RJ

April 18, 2019

KPMG Auditores Independentes, uma sociedade simples brasileira e firma-membro da rede KPMG de firmas-membro independentes e afiliadas à KPMG International Cooperative ("KPMG International"), uma entidade suíça.

KPMG Auditores Independentes, a Brazilian entity and a member firm of the KPMG network of independent member firms affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity.





Management's Report on Internal Control over Financial Reporting

The management of Vale S.A (Vale) is responsible for establishing and maintaining adequate internal control over financial reporting.

The Vale's 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. The company's 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 the company's 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 because of changes in conditions, and that the degree of compliance with the policies or procedures may deteriorate.

Vale's management has assessed the effectiveness of the company's internal control over financial reporting as of December 31, 2019 based on the criteria established in Internal Control—Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on such assessment and criteria, Vale's management has concluded that the company's internal control over financial reporting are effective as of December 31, 2019.

The effectiveness of the company's internal control over financial reporting as of December 31, 2019 has been audited by PricewaterhouseCoopers Auditores Independentes, an independent registered public accounting firm, as stated in their report which appears herein.

February 20, 2020.

Eduardo de Salles Bartolomeo
Chief Executive Officer

Luciano Siani
Chief Financial Officer and Investors Relations



Consolidated Income Statement
In millions of United States dollars, except earnings per share data

	Notes	Year ended December 31		
		2019	2018	2017
Continuing operations				
Net operating revenue.....	4(d)	37,570	36,575	33,967
Cost of goods sold and services rendered	5(a)	(21,187)	(22,109)	(21,039)
Gross profit		16,383	14,466	12,928
Operating expenses				
Selling and administrative expenses	5(b)	(487)	(523)	(531)
Research and evaluation expenses		(443)	(373)	(340)
Pre-operating and operational stoppage		(1,153)	(271)	(413)
Brumadinho event	3	(7,402)	-	-
Other operating expenses, net	5(c)	(505)	(445)	(420)
		(9,990)	(1,612)	(1,704)
Impairment and disposals of non-current assets	20	(5,074)	(899)	(294)
Operating income		1,319	11,955	10,930
Financial income.....	6	527	423	478
Financial expenses.....	6	(3,806)	(2,345)	(3,273)
Other financial items, net	6	(134)	(3,035)	(224)
Equity results and other results in associates and joint ventures	16 and 22	(681)	(182)	(82)
Income (loss) before income taxes		(2,775)	6,816	7,829
Income taxes				
Current tax.....	8	(1,522)	(752)	(849)
Deferred tax		2,117	924	(646)
		595	172	(1,495)
Net income (loss) from continuing operations		(2,180)	6,988	6,334
Net income (loss) attributable to noncontrolling interests		(497)	36	21
Net income (loss) from continuing operations attributable to Vale's stockholders		(1,683)	6,952	6,313
Discontinued operations				
Loss from discontinued operations	14	-	(92)	(813)
Loss attributable to noncontrolling interests		-	-	(7)
Loss from discontinued operations attributable to Vale's stockholders		-	(92)	(806)
Net income (loss)		(2,180)	6,896	5,521
Net income (loss) attributable to noncontrolling interests		(497)	36	14
Net income (loss) attributable to Vale's stockholders		(1,683)	6,860	5,507
Earnings (loss) per share attributable to Vale's stockholders:				
Basic and diluted earnings (loss) per share:.....	9			
Common share (US\$)		(0.33)	1.32	1.05

The accompanying notes are an integral part of these financial statements.



Consolidated Statement of Comprehensive Income
In millions of United States dollars

	Year ended December 31		
	2019	2018	2017
Net income (loss)	(2,180)	6,896	5,521
Other comprehensive income (loss):			
Items that will not be subsequently reclassified to income statement			
Translation adjustments	(1,677)	(6,762)	(717)
Retirement benefit obligations	(126)	41	(46)
Fair value adjustment to investment in equity securities	(184)	60	-
Transfer to reserve	-	(16)	-
Total items that will not be subsequently reclassified to income statement, net of tax	(1,987)	(6,677)	(763)
Items that may be subsequently reclassified to income statement			
Translation adjustments	1,111	3,899	1,026
Net investments hedge (note 25c)	(74)	(543)	(95)
Cash flow hedge	102	-	-
Transfer of realized results to net income	-	(78)	(11)
Total of items that may be subsequently reclassified to income statement, net of tax	1,139	3,278	920
Total comprehensive income (loss)	(3,028)	3,497	5,678
Comprehensive income (loss) attributable to noncontrolling interests	(512)	(84)	13
Comprehensive income (loss) attributable to Vale's stockholders	(2,516)	3,581	5,665
From continuing operations	(2,516)	3,589	5,696
From discontinued operations	-	(8)	(31)
	(2,516)	3,581	5,665

Items above are stated net of tax and the related taxes are disclosed in note 8.

The accompanying notes are an integral part of these financial statements.



Consolidated Statement of Cash Flows In millions of United States dollars

	Year ended December 31		
	2019	2018	2017
Cash flow from operations (a)	15,608	15,330	15,562
Interest on loans and borrowings paid (note 21)	(1,186)	(1,121)	(1,686)
Derivatives received (paid), net	(324)	(67)	(240)
Interest on participative stockholders' debentures paid	(179)	(113)	(135)
Income taxes (including settlement program)	(1,809)	(1,128)	(1,051)
Net cash provided by operating activities from continuing operations	12,110	12,901	12,450
Cash flow from investing activities:			
Capital expenditures	(3,704)	(3,784)	(3,831)
Additions to investments	(76)	(23)	(93)
Acquisition of subsidiary, net of cash (note 14)	(926)	-	-
Proceeds from disposal of assets and investments	142	1,481	922
Dividends received from associates and joint ventures	353	245	227
Judicial deposits and restricted cash (note 3)	(1,638)	-	-
Short-term investment (LFTs)	(828)	(50)	(90)
Other investments activities, net(i)	(312)	2,290	(493)
Net cash provided by (used in) investing activities from continuing operations	(6,989)	159	(3,358)
Cash flow from financing activities:			
Loans and borrowings from third-parties (note 21)	(2,275)	(6,616)	(7,022)
Payments of leasing (note 2d)	(224)	-	-
Dividends and interest on capital paid to stockholders	-	(3,313)	(1,456)
Dividends and interest on capital paid to noncontrolling interest	(184)	(182)	(126)
Share buyback program	-	(1,000)	-
Transactions with noncontrolling stockholders (note 14)	(812)	(17)	(98)
Net cash used in financing activities from continuing operations	(3,495)	(11,128)	(8,702)
Net cash used in discontinued operations	-	(46)	(252)
Increase in cash and cash equivalents	1,626	1,886	138
Cash and cash equivalents in the beginning of the year	5,784	4,328	4,262
Effect of exchange rate changes on cash and cash equivalents	(60)	(313)	(60)
Effects of disposals of subsidiaries and merger, net of cash and cash equivalents	-	(117)	(12)
Cash and cash equivalents at end of the year	7,350	5,784	4,328
Non-cash transactions:			
Additions to property, plant and equipment—capitalized loans and borrowing costs	140	194	370
Cash flow from operating activities:			
Income (loss) before income taxes from continuing operations	(2,775)	6,816	7,829
Adjusted for:			
Provisions related to Brumadinho (note 3)	6,550	-	-
Equity results and other results in associates and joint ventures	681	182	82
Impairment and disposal of non-current assets	5,074	899	294
Depreciation, amortization and depletion	3,726	3,351	3,708
Financial results, net	3,413	4,957	3,019
Changes in assets and liabilities:			
Accounts receivable	(25)	(156)	1,277
Inventories	110	(817)	(339)
Suppliers and contractors(ii)	655	(376)	232
Provision—Payroll, related charges and other remunerations	(94)	(11)	372
Proceeds from streaming transactions (note 7)	-	690	-
Payments related to Brumadinho (note 3)(iii)	(989)	-	-
Other assets and liabilities, net	(718)	(205)	(912)
Cash flow from operations (a)	15,608	15,330	15,562

(i) Includes loans and advances from/to related parties. For the year ended December 31, 2018, includes proceeds received from Nacala project finance (note 31b) in the amount of US\$2,572.

(ii) Includes variable lease payments.

(iii) Additionally, the Company has incurred in expenses in the amount of US\$730 recognized straight to the income statement, totaling the amount of US\$1,719 have already been disbursed by the Company related to the Brumadinho event.

The accompanying notes are an integral part of these financial statements.



Consolidated Statement of Financial Position
In millions of United States dollars

	Notes	December 31, 2019	December 31, 2018
Assets			
Current assets			
Cash and cash equivalents		7,350	5,784
Short-term investments	21	826	32
Accounts receivable	10	2,529	2,648
Other financial assets	13	759	403
Inventories	11	4,274	4,443
Prepaid income taxes		370	543
Recoverable taxes	12	552	883
Others		382	556
		17,042	15,292
Non-current assets			
Judicial deposits	28(c)	3,159	1,716
Other financial assets	13	2,722	3,144
Prepaid income taxes		597	544
Recoverable taxes	12	607	751
Deferred income taxes	8(a)	9,217	6,908
Others		496	263
		16,798	13,326
Investments in associates and joint ventures	16	2,798	3,225
Intangibles	18	8,499	7,962
Property, plant and equipment	19	46,576	48,385
		74,671	72,898
Total assets		91,713	88,190
Liabilities			
Current liabilities			
Suppliers and contractors		4,107	3,512
Loans and borrowings	21	1,214	1,003
Leases	2(d)	225	—
Other financial liabilities	13	1,074	1,604
Taxes payable		512	428
Settlement program ("REFIS")	8(d)	431	432
Liabilities related to associates and joint ventures	22	516	289
Provisions	26	1,230	1,363
Liabilities related to Brumadinho	3	1,568	—
De-characterization of dams	3	309	—
Interest on capital		1,571	—
Others		1,088	480
		13,845	9,111
Non-current liabilities			
Loans and borrowings	21	11,842	14,463
Leases	2(d)	1,566	—
Other financial liabilities	13	4,372	2,877
Settlement program ("REFIS")	8(d)	3,476	3,917
Deferred income taxes	8(a)	1,882	1,532
Provisions	26	8,493	7,095
Liabilities related to Brumadinho	3	1,415	—
De-characterization of dams	3	2,180	—
Liabilities related to associates and joint ventures	22	1,184	832
Streaming transactions	7	2,063	2,293
Others		402	1,238
		38,875	34,247
Total liabilities		52,720	43,358
Stockholders' equity			
Equity attributable to Vale's stockholders	30	40,067	43,985
Equity attributable to noncontrolling interests		(1,074)	847
Total stockholders' equity		38,993	44,832
Total liabilities and stockholders' equity		91,713	88,190

The accompanying notes are an integral part of these financial statements.



Consolidated Statement of Changes in Equity
In millions of United States dollars

	Share capital	Capital reserve	Profit reserves	Treasury stocks	Other reserves	Cumulative translation adjustments	Retained earnings	Equity attributable to Vale's stockholders	Equity attributable to noncontrolling interests	Total stockholders' equity
Balance at December 31, 2016	61,614	–	4,203	(1,477)	(1,998)	(23,300)	–	39,042	1,982	41,024
Net income	–	–	–	–	–	–	5,507	5,507	14	5,521
Other comprehensive income.....	–	–	(158)	–	(36)	352	–	158	(1)	157
Dividends and interest on capital of Vale's stockholders.....	–	–	(658)	–	–	–	(1,475)	(2,133)	–	(2,133)
Dividends of noncontrolling interest	–	–	–	–	–	–	–	–	(202)	(202)
Acquisitions and disposal of noncontrolling interest ...	–	–	–	–	(255)	–	–	(255)	(512)	(767)
Capitalization of noncontrolling interest advances	–	–	–	–	–	–	–	–	33	33
Appropriation to undistributed retained earnings	–	–	4,032	–	–	–	(4,032)	–	–	–
Merger of Valepar (note 30).....	–	1,139	–	–	–	–	–	1,139	–	1,139
Balance at December 31, 2017	61,614	1,139	7,419	(1,477)	(2,289)	(22,948)	–	43,458	1,314	44,772
Net income	–	–	–	–	–	–	6,860	6,860	36	6,896
Other comprehensive income.....	–	–	(1,257)	–	134	(2,156)	–	(3,279)	(120)	(3,399)
Dividends and interest on capital of Vale's stockholders.....	–	–	–	–	–	–	(2,054)	(2,054)	–	(2,054)
Dividends of noncontrolling interest	–	–	–	–	–	–	–	–	(166)	(166)
Acquisitions and disposal of noncontrolling interest ...	–	–	–	–	–	–	–	–	(229)	(229)
Capitalization of noncontrolling interest advances	–	–	–	–	–	–	–	–	12	12
Appropriation to undistributed retained earnings	–	–	4,806	–	–	–	(4,806)	–	–	–
Share buyback program	–	–	–	(1,000)	–	–	–	(1,000)	–	(1,000)
Balance at December 31, 2018	61,614	1,139	10,968	(2,477)	(2,155)	(25,104)	–	43,985	847	44,832
Loss	–	–	–	–	–	–	(1,683)	(1,683)	(497)	(2,180)
Other comprehensive income.....	–	–	(428)	–	(298)	(107)	–	(833)	(15)	(848)
Interest on capital of Vale's stockholders	–	–	(1,767)	–	–	–	–	(1,767)	–	(1,767)
Dividends of noncontrolling interest	–	–	–	–	–	–	–	–	(87)	(87)
Acquisitions and disposal of noncontrolling interest ...	–	–	–	–	343	–	–	343	(1,350)	(1,007)
Capitalization of noncontrolling interest advances	–	–	–	–	–	–	–	–	28	28
Allocation of loss.....	–	–	(1,683)	–	–	–	1,683	–	–	–
Assignment and transfer of shares (note 30)	–	–	–	22	–	–	–	22	–	22
Balance at December 31, 2019	61,614	1,139	7,090	(2,455)	(2,110)	(25,211)	–	40,067	(1,074)	38,993

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The accompanying notes are an integral part of these financial statements.



Notes to the Financial Statements

Expressed in millions of United States dollar, unless otherwise stated

1. Corporate information

Vale S.A. and its direct and indirect subsidiaries (“Vale” or the “Company”) are global producers of iron ore and iron ore pellets, key raw materials for steelmaking, and producers of nickel, which is used to produce stainless steel and metal alloys employed in the production of several products. The Company also produces copper, metallurgical and thermal coal, manganese ore, ferroalloys, platinum group metals, gold, silver and cobalt. The information by segment is presented in note 4.

Vale S.A. (the “Parent Company”) is a public company headquartered in the city of Rio de Janeiro, Brazil with securities traded on the stock exchanges of São Paulo—B3 S.A. (VALE3), New York—NYSE (VALE) and Madrid—LATIBEX (XVALO).

2. Basis of preparation of the financial statements

a) Statement of compliance

The consolidated financial statements of the Company (“financial statements”) have been prepared and are being presented in accordance with International Financial Reporting Standards (“IFRS”) as issued by the International Accounting Standards Board (“IASB”).

b) Basis of presentation

The financial statements have been prepared on a historical cost basis as adjusted to reflect: (i) the fair value of financial instruments measured at fair value through income statement or at fair value through the statement of comprehensive income; and (ii) impairment of assets.

Certain reclassifications have been made to amounts presented in the explanatory notes to conform to the current year presentation.

These financial statements were authorized for issue on February 20, 2020, except for notes 3 (f.iii) and 34, as to which the date of approval is April 3, 2020.

c) Functional currency and presentation currency

The financial statements of the Company and its associates and joint ventures are measured using the currency of the primary economic environment in which the entity operates (“functional currency”), which in the case of the Parent Company is the Brazilian real (“R\$”). For presentation purposes, these financial statements are presented in United States dollar (“US\$”) as the Company believes that this is how international investors analyze the financial statements.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

2. Basis of preparation of the financial statements (Continued)

The exchange rates used by the Company to translate its foreign operations are as follows:

	Closing rate			Average rate for the year ended		
	2019	2018	2017	2019	2018	2017
US Dollar ("US\$").....	4.0307	3.8748	3.3080	3.9461	3.6558	3.1925
Canadian dollar ("CAD")	3.1034	2.8451	2.6344	2.9746	2.8190	2.4618
Euro ("EUR" or "€")	4.5305	4.4390	3.9693	4.4159	4.3094	3.6088

d) Significant accounting policies

Significant accounting policies used in the preparation of these financial statements are disclosed in the respective notes. The accounting policies have been consistently applied to all years presented, except for the adoption of the new accounting standards described as follows:

IFRIC 23 Uncertainty over income tax treatments—IFRIC 23 became effective for annual periods beginning on or after January 1, 2019 and clarifies the measurement and recognition requirements of IAS 12 Income taxes. It does not apply to taxes or levies outside the scope of IAS 12, nor does it specifically include requirements relating to interest and penalties associated with uncertain tax treatments. The Interpretation specifically addresses the following: (i) whether an entity considers uncertain tax treatments separately, (ii) the assumptions an entity makes about the examination of tax treatments by tax authorities, and (iii) how an entity determines taxable profit (tax loss), tax bases, unused tax losses, unused tax credits, and tax rates.

Upon adoption of the Interpretation, the Company considered whether it has any uncertain tax positions, particularly those relating to the deduction of social security contributions on the net income ("*CSLL*") in Brazil, and determined that, although there is an uncertainty that could affect the 2018 year end, it is deemed probable that the Company's treatments will be accepted by the Brazilian tax authority. Further details in relation to this uncertain tax position is disclosed in note 8.

IFRS 16 Leases—The Company applied IFRS 16 from January 1, 2019 using the retrospective approach with the cumulative effect recognized as at the date of initial application. Accordingly, the comparative information has not been restated and continues to be presented under IAS 17 and related interpretations. On transitioning to IFRS 16, the lease agreements were recognized in the statement of financial position and measured discounting the remaining minimum contractual payments at the present value, using the Company's incremental borrowing rate, depending on the remaining lease term.

The Company used the following practical expedients in applying IFRS 16: (i) applied a single discount rate to a portfolio of leases with similar characteristics; (ii) applied the exemption not to recognize right-of-use assets and liabilities for leases with less than 12 months of lease term and/or leases of low-value assets. The payments associated to these leases will be recognized as an expense on a straight-line basis over the lease term; and (iii) used hindsight when determining the lease term, to determine if the contract contains options to extend or terminate the lease.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

2. Basis of preparation of the financial statements (Continued)

As a result of IFRS 16 adoption, the Company has changed its accounting policy for lease contracts, except for its mineral leases, as the standard excludes from its scope leases to explore for or use minerals, oil, natural gas and similar non-regenerative resources. Details of these changes are summarized below.

The ferrous minerals produced in Brazil are mainly shipped to Asia. The Company has leased the Ponta da Madeira and Itaguai maritime terminals in Brazil, that are primarily for the delivery of iron ore and iron ore pellets to bulk carrier vessels. The remaining lease terms are, respectively, 4 and 7 years for the ports in Brazil. Vale also has a lease agreement for a maritime terminal in Oman, which is used to deliver iron ore pellets produced in that location. The remaining lease term is 24 years for the port in Oman.

Some of the delivery of iron ore from Brazil to the Asian clients are made through five time-charter agreements, which have 11 years remaining lease term on average.

As part of the ferrous minerals segment, the Company also has long-term agreements for the exploration and processing of iron ore with its joint ventures, such as the agreements to lease the pelletizing plants in Brazil. These lease agreements contain variable payment terms based on the pellet production.

In addition, the Company leases an oxygen plant dedicated to the base metals operation, as part of its nickel operation run in Canada. The remaining period of this lease agreement is 11 years.

The Company also has a long-term contract related to the right of use of certain locomotives dedicated to the transportation of coal in Mozambique, which has a remaining lease term of 7 years.

Vale has leased properties for its operational facilities and commercial and administrative offices in the various locations where the Company conducts its business.

Following are the discount rates applied in discounting the lease liabilities at present value:

	Discount rate
Ports	3% to 6%
Vessels	3% to 6%
Pellets plants	3% to 6%
Properties	3% to 7%
Energy plants	4% to 5%
Locomotives	7%
Mining equipment	4% to 6%

Until December 31, 2018, the lease arrangements were classified as operating leases and were not recognized in the Company's statement of financial position. The contractual payments were recognized in the income statement on a straight-line basis over the term of the lease.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

2. Basis of preparation of the financial statements (Continued)

Following are the lease liabilities recognized under IFRS 16 reconciled to the disclosed operating lease commitments under IAS 17, as at December 31, 2018:

	Lease commitments disclosed on December 31, 2018	Contracts scoped out	Present value adjustment	Lease liability recognized on January 1, 2019
Ports	1,131	–	(364)	767
Vessels	769	(1)	(164)	604
Pellets plants	218	(15)	(52)	151
Properties	162	(1)	(24)	137
Energy plants	94	–	(29)	65
Locomotives	68	(7)	(16)	45
Mining equipment	55	(18)	(5)	32
Total	2,497	(42)	(654)	1,801

The lease liability is presented on the statement of financial position as “Leases” and the accounting policy related to leases is disclosed in note 19. The total amount of the variable lease payments not included in the measurement of lease liabilities, which have been recognized straight to the income statement, for the year ended December 31, 2019 was US\$560. The interest accretion recognized in the income statement is disclosed in note 6.

Changes in the recognized right-of-use assets and leases liabilities are as follows:

						Assets
	January 1, 2019	Additions and contract modifications(i)	Impairment(ii)	Depreciation	Translation adjustment	December 31, 2019
Ports	767	13	–	(41)	(5)	734
Vessels	604	28	–	(50)	–	582
Pellets plants	151	60	–	(35)	(15)	161
Properties	137	42	(16)	(30)	–	133
Energy plants	65	4	–	(7)	2	64
Locomotives	45	–	(39)	(6)	–	–
Mining equipment	32	–	–	(14)	–	18
Total	1,801	147	(55)	(183)	(18)	1,692

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

2. Basis of preparation of the financial statements (Continued)

						Liabilities
	January 1, 2019	Additions and contract modifications(i)	Payments	Interest	Translation adjustment	December 31, 2019
Ports	767	13	(55)	31	(6)	750
Vessels	604	28	(74)	22	-	580
Pellets plants	151	60	(36)	8	(8)	175
Properties	137	42	(34)	7	-	152
Energy plants	65	4	(7)	4	5	71
Locomotives	45	-	(8)	3	-	40
Mining equipment	32	-	(10)	1	-	23
Total	1,801	147	(224)	76	(9)	1,791

- (i) Additions mainly relates to new administrative offices lease and to renewal of the contract with Nibrasco, a pelletizing plant, which expires in December 2022.
- (ii) Relates to the impairment of coal business assets, which resulted in the provision for loss of properties e and locomotive right of use assets. Further details in relation to the impairment is disclosed in note 20.

The annual minimum payments are presented as follows:

	2020	2021	2022	2023	2024 onwards	Total
Ports	59	59	59	58	851	1,086
Vessels	67	65	63	62	465	722
Pellets plants	35	31	31	11	110	218
Properties	42	37	22	18	64	183
Energy plants	7	7	7	7	64	92
Locomotives	8	8	8	8	23	55
Mining equipment	7	6	6	4	4	27
Total	225	213	196	168	1,581	2,383

The amounts in the table above presents the undiscounted lease obligation by maturity date. The lease liability disclosed as "leases" in the balance sheet is measured at the present value of such obligations.

f) Critical accounting estimates and judgments

The preparation of financial statements requires the use of critical accounting estimates and the application of judgment by management in applying the Company's accounting policies. These estimates are based on the experience, best knowledge, information available at the statement of financial position date and other factors, including expectations of future events that are believed to be reasonable under the circumstances. Changes in facts and circumstances may lead to the revision of these estimates. Actual future results may differ from estimates.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

2. Basis of preparation of the financial statements (Continued)

The significant estimates and judgments applied by the Company in the preparation of these financial statements are as follows:

Note	Significant estimates and judgments
3	Brumadinho dam failure
7	Deferred revenue
8	Deferred income taxes
15	Consolidation
19	Mineral reserves and mine useful life
20	Impairment of non-current assets
22	Liabilities related to associates and joint ventures
24	Fair values estimate
27	Asset retirement obligation
28	Litigation
29	Employee post-retirement obligations

3. Brumadinho dam failure

On January 25, 2019, a tailings dam (“Dam I”) failed at the Córrego do Feijão mine, in the city of Brumadinho, state of Minas Gerais. The failure released a flow of tailings debris, destroying some of Vale’s facilities, affecting local communities and disturbing the environment. The tailings released have caused an impact of around 315 km in extension, reaching the nearby Paraopeba River. The dam failure in Brumadinho (“event”) resulted in 270 fatalities or presumed fatalities.

The Córrego do Feijão mine is part of the Paraopeba complex, in the Southern System. Dam I contained approximately 11.7 million cubic meters of iron ore tailings and was inactive since 2016 (that is, without additional tailings disposal). Dam I was raised by building successive layers (“lifts”) above the tailings accumulated in the reservoir, a technique known as the “upstream” method. There are two other raising methods, the “downstream” and “centerline” methods. Each of these methods presents a different risk profile.

The Company has been taking the necessary actions to support the victims and to mitigate and recover the social and environmental damages resulting from the event. Vale has provided support in multiple ways, aiming to ensure the humanitarian assistance to those affected by the dam failure. The Company has been focused on preventing further similar events through the accelerated decommissioning of upstream and some centerline dams.

In addition, Vale has determined the suspension of the Shareholder’s Remuneration Policy and any other resolution related to shares buyback.

As a result of the dam failure, the Company recognized in the income statement a total impact of US\$7,402 (R\$28,818 million) for the year ended December 31, 2019 to meet its assumed obligations,

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

including de-characterization of the dams, indemnification and donations to those affected by the event, remediation of the affected areas and compensation to the society.

a) De-characterization of the dams

(a.i) Company's dams

On January 29, 2019, the Company informed the market and Brazilian authorities the decision to speed up the plan to "de-characterize" all of its tailings dams built under the upstream method (same method as Brumadinho's dam), located in Brazil. The "de-characterization" means that the structure will be dismantled so the structure is effectively no longer a dam. After the event, the Brazilian National Mining Agency ("*Agência Nacional de Mineração—ANM*") set new safety criteria for dams, determining the de-characterization of structures built under the upstream and centerline methods.

Before the event, the decommissioning plans of these dams were based on a method which aimed to ensure the physical and chemical stability of the structures, not necessarily, in all cases, removing in full and potentially processing the tailings contained in the dams. Since the event, the Company has been working to develop detailed de-characterization engineering plan for each of these dams.

The updated plans indicate that for certain of these upstream dams, firstly, the Company will have to reinforce the downstream massive structures, and conclude the de-characterization subsequently, according to the geotechnical and geographic conditions of each of them. It was also considered whether additional containment structures should be built, depending on the safety level of the structure.

Following the Company's decision and new standards set by ANM, the Company has undertaken an assessment of its dam structures since the event and recorded a provision for the de-characterization of upstream, certain "centerline structures" and dikes that have been identified to date.

Vale has developed engineering projects for these structures and the total expected costs to carry out all de-characterization projects resulted in a provision of US\$2,625 (R\$10,274 million) recognized in the income statement.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

The changes in the provision for the year ended December 31, 2019 are as follows:

	2019
Provision recognized	2,625
Payments	(159)
Interest accretion	101
Translation adjustment.....	(78)
Balance at December 31	2,489
Current liabilities.....	309
Non-current liabilities	2,180
Liabilities	<u>2,489</u>

The measurement of the costs and recognition of the provision takes into consideration several assumptions and estimates, which rely on factors, for which some are not under the Company's control. The main critical assumptions and estimates applied considers, among others: (i) volume of the waste to be removed based on historical data available and interpretation of the enacted laws and regulations; (ii) location availability for the tailings disposal; (iii) acceptance by the authorities of the proposed engineering methods and solution; and (iv) updates in the discount rate. Therefore, changes in the critical assumptions and estimates may result in a material change to the amount provided as at December 31, 2019.

(a.ii) Associates and joint ventures upstream dams

Some of our investees also operate similar dam structures and as detailed in the note 22 to these financial statements, the Company recognized a provision of US\$257 (R\$993 million) during 2019 as "Equity results and other results in associates and joint ventures" in relation to the de-characterization of the Germano tailings dam, owned by Samarco Mineração S.A.

b) Framework Agreements and donations

The Company has been working together with the authorities and society to remediate the environmental and social impacts of the event. Therefore, the Company has started negotiations and entered into agreements with the relevant authorities and affected people. Vale has also signed an instrument committing to donate to Brumadinho city, other institutions, to the families with missing members or affected by fatalities, to business owners of the region and families that resided in the Self-Saving Zone near to the Brumadinho dam.

Vale has also developed studies and projects to ensure geotechnical safety of the remaining structures at the Córrego do Feijão mine, in Brumadinho, and the removal and proper disposal of the tailings, especially alongside the Paraopeba river. In addition, Vale has set up an exclusive structure for treatment of the rescued animals, enabling emergency care and recovery.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

The changes in the provision in the year ended December 31, 2019 are as follows:

	2019
Provision for social and economic compensation	2,735
Provision for environmental remediation and compensation	1,190
Payments	(831)
Interest accretion	47
Translation adjustment	(158)
Balance at December 31	2,983
Current liabilities	1,568
Non-current liabilities	1,415
Liabilities	<u>2,983</u>

The total amount of this provision may vary due to the early stage of the ongoing negotiations, timing and scope of the measures currently being discussed, which are subject to the approval and consent by the relevant authorities.

In addition, the Company is under negotiations with the Government of the State of Minas Gerais (“GEMG”) and other relevant authorities for an additional agreement for collective damages indemnification and further compensation for the society and environment. The goal of Vale with a potential agreement would be to provide a stable legal framework for the execution of reparation and compensation, with the suspension of the existing civil lawsuits.

The potential agreement is still very uncertain as it is subject to conclusion of the ongoing negotiations and approval by the Company, the Government of the State of Minas Gerais, Public Prosecutors and other Authorities and Intervenant parties.

Therefore, the provisions recorded in these financial statements do not include the potential outcome of the current negotiation as it is not yet possible to reliably estimate an amount or whether the current negotiations will be successful.

The estimate of the economic impact of a potential agreement will depend on (i) final agreement on the list of reparation and compensation projects, (ii) a detailed assessment of the estimates of the amounts to be spent on the reparation and compensation projects being discussed, (iii) an analysis of the detailed scope of such projects to determine their overlap with the initiatives and amounts already provisioned; and (iv) the timing of the execution of projects and disbursements, which will impact the present value of the obligations.

Based on the current terms under discussion, and preliminary estimates subject to the uncertainties listed above, such possible agreement might result in an additional provision ranging from US\$1 billion

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

(R\$4 billion) to US\$2 billion (R\$8 billion). All accounting impacts, if any, will be recorded in the period an agreement is reached.

(b.i) Public Defendants

On April 5, 2019, Vale and the Public Defendants of the State of Minas Gerais formalized an agreement under which those affected by the Brumadinho's Dam failure may join an individual or family group out-of-court settlement agreements for the indemnification of material, economic and moral damages. This agreement establishes the basis for a wide range of indemnification payments, which were defined according to the best practices and case law of Brazilian Courts.

(b.ii) Public Ministry of Labor

On July 15, 2019, Vale signed a final agreement with the Public Ministry of Labor to indemnify the direct and third-party employees of the Córrego do Feijão mine who were affected by the termination of this operation.

Under the terms of the final agreement, Vale will either maintain the jobs of its direct employees and third-party employees until January 25, 2023 or convert this benefit into a cash compensation. The agreement also includes indemnification payments to the relatives of the fatal victims of the event, which may vary depending on their relationship with the victims, and a lifelong medical insurance benefit to the widows and widowers and a similar benefit to the dependents of the victims until they are 25 years old.

In addition, the agreement set a collective moral damage indemnification payment in the amount of US\$104 (R\$400 million), which has been fully paid in 2019.

(b.iii) Brazilian Federal Government, State of Minas Gerais, Public Prosecutors

On February 20, 2019, Vale entered into a judicial preliminary agreement with the State of Minas Gerais, Federal Government, the Public Prosecutors of the State of Minas Gerais, the Federal Public Prosecutors and the Public Defenders of the State of Minas Gerais and representatives of Public Authorities in which the Company commits to make, subject to registration, emergency indemnification payments to the residents of Brumadinho and the communities that are located downstream up to one kilometer from the Paraopeba river bed, from Brumadinho to the city of Pompéu. Due to this agreement, the Company anticipated the indemnities through monthly payments, according to the age of the beneficiary and other factors, during a 12-month period.

On November 28, 2019, the extension of emergency indemnification payments was ratified to those affected by the dam rupture for 10 months, starting from January 25, 2020.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

(b.iv) Environmental remediation and compensation

On July 8, 2019, Vale has entered into an agreement with *Companhia de Saneamento de Minas Gerais* (“COPASA”) to implement several actions to clean up the affected areas and to upgrade the retention water system alongside the Paraopeba River and some other water collection points nearby the affected area. In addition, the Company mobilized the dredging of part of the material released, including cleaning and de-sanding of the Paraopeba river channel.

c) Incurred expenses

The Company has incurred in expenses, which do not qualify for provision and have been recognized straight to the income statement, in the amount of US\$730 (R\$2,903 million) for the year ended December 31, 2019. These expenses include communication services, accommodation and humanitarian assistance, equipment, legal services, water, food aid, taxes, among others.

d) Operation stoppages

The Company has suspended some operations due to judicial decisions or technical analysis performed by the Company on its upstream dam structures. The Company recorded a loss of US\$759 (R\$2,997 million) related to the operational stoppage and idle capacity of the ferrous mineral segment as “Pre-operating and operational stoppage” for the year ended December 31, 2019. During 2019, certain operations have partially returned and the Company is working on legal and technical measures to resume all operations at full capacity.

e) Assets write-off

Following the event and the decision to speed up the de-characterization of the upstream dams, the Company recognized a loss of US\$235 (R\$904 million) as “Impairment and disposal of non-current assets” for the year ended December 31, 2019 in relation to the assets write-off of the Córrego do Feijão mine and those related to the other upstream dams in Brazil.

f) Contingencies and other legal matters

Vale is subject to significant contingencies due to the Brumadinho dam failure. Vale has already been named on several judicial and administrative proceedings brought by authorities and affected people and is currently under investigations. Vale is evaluating these contingencies and would recognize a provision based on the updates on the stage of these claims.

Following these contingencies, approximately US\$1,608 (R\$6,480 million) of the Company’s assets are restricted as at December 31, 2019, of which approximately US\$125 (R\$504 million) of the Company’s bank accounts are restricted and US\$1,483 (R\$5,976 million) were converted into judicial deposits.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

For the Brumadinho event, the Company has additional guarantees in the amount of US1,396 (R\$5,626 million), which were presented in court and used to release the respective judicial deposit during the year ended December 31, 2019. The expenses related to these additional guarantees in the amount of US\$9 (R\$36 million) was recorded as financial expense in the Company's income statement for the year ended December 31, 2019.

(f.i) Administrative sanctions

The Company was notified of the imposition of administrative fines by the Brazilian Institute of the Environment and Renewable Natural Resources ("IBAMA"), in the amount of US\$62 (R\$250 million), which the Company expects to settle through environmental projects. Furthermore, the Secretary for Environment—SEMA Brumadinho imposed administrative fines, in the total amount of US\$45 (R\$181 million). Both amounts are also recorded as at December 31, 2019.

(f.ii) U.S. Securities class action suits

Vale and certain of its officers and former officers have been named defendants in civil putative 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 on October 25, 2019 before the United States District Court for the Eastern District of New York.

The Lead Plaintiff alleges that we made false and misleading statements or omitted to make disclosures concerning the risks of the operations of Dam I in the Córrego de Feijão mine and the adequacy of the related programs and procedures. The Lead Plaintiff has not specified an amount of alleged damages in these actions. On December 13, 2019, the Company made a motion to dismiss the amended complaint.

Vale intends to defend against this action and mount a full defense against these claims. Based on the assessment of the Company's legal consultants and given its preliminary status, the expectation of loss of this proceeding is classified as possible. However, given the preliminary status of the action, it is not possible at this time to determine a reliable estimate of the potential exposure.

Subsequent events are disclosed on note 34.

(f.iii) Cooperation with the SEC

The Company is cooperating with the SEC by providing documents and other information concerning the failure of Dam I as requested by the agency.

g) Insurance

The Company is negotiating with insurers under its operational risk and civil liability, but these negotiations are still at a preliminary stage. Any payment of insurance proceeds will depend on the

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

3. Brumadinho dam failure (Continued)

coverage definitions under these policies and assessment of the amount of loss. Due to uncertainties, no indemnification to the Company was recognized in Vale's financial statements.

Accounting policy

Provisions are measured at the present value of management's best estimate of the expenditure required to settle the present obligation at the end of the reporting period. The discount rate used to determine the present value is a pre-tax rate that reflects current market assessments of the time value of money and the risks specific to the liability. The increase in the provision due to the passage of time is recognized as interest expense. Provisions are not recognized for future operating losses.

Critical accounting estimates and judgments

The measurement of the provision requires the use of significant judgements, estimates and assumptions. The provision reflects the estimated costs to comply with Vale's obligation in relation to the event. The provision may be affected by factors including, but not limited to: (i) changes in laws and regulations; (ii) changes in the current estimated market price of the direct and indirect cost related to products and services, (iii) changes in timing for cash outflows, (iv) changes in the technology considered in measuring the provision, (v) number of individuals entitled to the indemnification payments, (vi) resolution of existing and potential legal claims, (vii) demographic assumptions, (viii) actuarial assumptions, and (ix) updates in the discount rate.

Therefore, future expenditures may differ from the amounts currently provided because the realized assumptions and various other factors are not always under the Company's control. These changes to key assumptions could result in a material impact to the amount of the provision in future reporting periods. At each reporting period, the Company will reassess the key assumptions used in the preparation of the projected cash flows and will adjust the provision, if required.

4. Information by business segment and by geographic area

The Company operated the following reportable segments during this year: Ferrous Minerals, Base Metals and Coal. The segments are aligned with products and reflect the structure used by Management to evaluate Company's performance. The responsible bodies for making operational decisions, allocating resources and evaluating performance are the Executive Boards and the Board of Directors. The performance of the operating segments is assessed based on a measure of adjusted EBITDA.

The information presented to the Executive Board on the performance of each segment is derived from the accounting records, adjusted for reallocations between segments.

The main activities of the operating segments are as follows:

Ferrous minerals—comprise of the production and extraction of iron ore, iron ore pellets, manganese, ferroalloys, other ferrous products and its logistic services.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

Base metals—include the production and extraction of nickel and its by-products (copper, gold, silver, cobalt, precious metals and others) and copper, as well as its by-products (gold and silver).

Coal—comprise of the production and extraction of metallurgical and thermal coal and its logistic services.

Fertilizers (Discontinued operations)—include the production of potash, phosphate, nitrogen and other fertilizer products (note 14).

In 2019, due to the Brumadinho dam failure, the Company has created the Special Recovery and Development Board, which is in-charge of social, humanitarian, environmental and structural recovery measures that are implemented in Brumadinho and other affected areas. This Board reports to the CEO and assess the costs related to the Brumadinho event. These costs are not directly related to the Company's operating activities and, therefore, were not allocated to any operating segment.

The Company allocate to "Others" the revenues and cost of other products, services, research and development, investments in joint ventures and associates of other business and unallocated corporate expenses.

a) Adjusted EBITDA

The definition of Adjusted EBITDA for the Company is the operating income or loss plus dividends received and interest from associates and joint ventures, and excluding the amounts charged as (i) depreciation, depletion and amortization and (ii) impairment and disposal of non-current assets.

	Year ended December 31, 2019						
	Net operating revenue	Cost of goods sold and services rendered	Sales, administrative and other operating expenses	Research and evaluation	Pre operating and operational stoppage	Dividends received and interest from associates and joint ventures	Adjusted EBITDA
Ferrous minerals							
Iron ore	23,343	(8,778)	(323)	(123)	(750)	29	13,398
Iron ore pellets	5,948	(2,666)	(20)	(16)	(72)	258	3,432
Ferroalloys and manganese	282	(220)	(8)	(2)	(1)	-	51
Other ferrous products and services	432	(324)	-	(1)	-	9	116
	30,005	(11,988)	(351)	(142)	(823)	296	16,997
Base metals							
Nickel and other products	4,257	(2,867)	(75)	(44)	(28)	-	1,243
Copper	1,904	(905)	(5)	(43)	(20)	-	931
	6,161	(3,772)	(80)	(87)	(48)	-	2,174
Coal	1,021	(1,638)	1	(30)	-	113	(533)
Brumadinho event	-	-	(7,402)	-	-	-	(7,402)
Others	383	(390)	(506)	(184)	(11)	57	(651)
Total	37,570	(17,788)	(8,338)	(443)	(882)	466	10,585



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

	Year ended December 31, 2018						
	Net operating revenue	Cost of goods sold and services rendered	Sales, administrative and other operating expenses	Research and evaluation	Pre operating and operational stoppage	Dividends received and interest from associates and joint ventures	Adjusted EBITDA
Ferrous minerals							
Iron ore	20,354	(9,048)	(76)	(110)	(115)	28	11,033
Iron ore pellets	6,651	(3,393)	(11)	(26)	(19)	154	3,356
Ferroalloys and manganese	454	(290)	(3)	(1)	-	-	160
Other ferrous products and services	474	(313)	(4)	(1)	(1)	7	162
	27,933	(13,044)	(94)	(138)	(135)	189	14,711
Base metals							
Nickel and other products	4,610	(3,060)	(47)	(39)	(33)	-	1,431
Copper	2,093	(960)	(4)	(18)	-	-	1,111
	6,703	(4,020)	(51)	(57)	(33)	-	2,542
Coal	1,643	(1,575)	(9)	(21)	-	143	181
Others	296	(263)	(752)	(157)	(21)	56	(841)
Total from continuing operations	36,575	(18,902)	(906)	(373)	(189)	388	16,593
Discontinued operations							
(Fertilizers)	121	(120)	(4)	-	-	-	(3)
Total	36,696	(19,022)	(910)	(373)	(189)	388	16,590

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

	Year ended December 31, 2017						
	Net operating revenue	Cost of goods sold and services rendered	Sales, administrative and other operating expenses	Research and evaluation	Pre operating and operational stoppage	Dividends received and interest from associates and joint ventures	Adjusted EBITDA
Ferrous minerals							
Iron ore	18,524	(7,950)	11	(88)	(181)	30	10,346
Iron ore pellets	5,653	(2,876)	(9)	(19)	(7)	81	2,823
Ferroalloys and manganese	469	(278)	(8)	-	(4)	-	179
Other ferrous products and services	483	(306)	11	(2)	-	19	205
	<u>25,129</u>	<u>(11,410)</u>	<u>5</u>	<u>(109)</u>	<u>(192)</u>	<u>130</u>	<u>13,553</u>
Base metals							
Nickel and other products	4,667	(3,437)	(47)	(49)	(75)	-	1,059
Copper	2,204	(979)	(15)	(13)	-	-	1,197
	<u>6,871</u>	<u>(4,416)</u>	<u>(62)</u>	<u>(62)</u>	<u>(75)</u>	<u>-</u>	<u>2,256</u>
Coal	1,567	(1,354)	(12)	(14)	(4)	179	362
Others	400	(375)	(791)	(155)	(9)	97	(833)
Total of continuing operations ...	<u>33,967</u>	<u>(17,555)</u>	<u>(860)</u>	<u>(340)</u>	<u>(280)</u>	<u>406</u>	<u>15,338</u>
Discontinued operations							
(Fertilizers)	1,746	(1,606)	(102)	(12)	(25)	3	4
Total	<u>35,713</u>	<u>(19,161)</u>	<u>(962)</u>	<u>(352)</u>	<u>(305)</u>	<u>409</u>	<u>15,342</u>

Adjusted EBITDA is reconciled to net income (loss) as follows:

From continuing operations

	Year ended December 31		
	2019	2018	2017
Net income (loss) from continuing operations attributable to Vale's stockholders	<u>(1,683)</u>	<u>6,952</u>	<u>6,313</u>
Net income (loss) attributable to noncontrolling interests	(497)	36	21
Net income (loss) from continuing operations	<u>(2,180)</u>	<u>6,988</u>	<u>6,334</u>
Depreciation, depletion and amortization	3,726	3,351	3,708
Income taxes	(595)	(172)	1,495
Financial results	3,413	4,957	3,019
Equity results and other results in associates and joint ventures	681	182	82
Dividends received and interest from associates and joint ventures(i)	466	388	406
Impairment and disposal of non-current assets	5,074	899	294
Adjusted EBITDA from continuing operations	<u>10,585</u>	<u>16,593</u>	<u>15,338</u>

(i) Includes remuneration of the financial instrument in the coal segment.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

From discontinued operations

	Year ended December 31	
	2018	2017
Loss from discontinued operations attributable to Vale's stockholders	(92)	(806)
Loss attributable to noncontrolling interests	-	(7)
Loss from discontinued operations	(92)	(813)
Depreciation, depletion and amortization	-	1
Income taxes	(40)	(102)
Financial results	5	28
Equity results in associates and joint ventures	-	2
Dividends received from associates and joint ventures	-	3
Impairment of non-current assets	124	885
Adjusted EBITDA from discontinued operations	(3)	4

b) Assets by segment

	December 31, 2019			December 31, 2018		
	Product inventory	Investments in associates and joint ventures	Property, plant and equipment and intangibles(i)	Product inventory	Investments in associates and joint ventures	Property, plant and equipment and intangibles(i)
Ferrous minerals	1,955	1,729	33,528	2,210	1,814	31,377
Base metals	1,354	14	19,893	1,147	14	21,295
Coal	60	-	-	119	317	1,589
Others	2	1,055	1,654	11	1,080	2,086
Total	3,371	2,798	55,075	3,487	3,225	56,347

In December 2019, the Company recognize impairment losses for the coal assets from operations in Mozambique and for the base metals assets from operations in New Caledonia. Further details are disclosed in note 20. In September 2019, upon a favorable decision from the Brazilian Supreme Court ("STF"), the Company resumed Onça Puma operation (base metals), which is comprised of mineral extraction and nickel processing activities. The mineral extraction operations had been suspended since September 2017 and nickel processing activities since June 2019.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

	Year ended December 31								
	2019			2018			2017		
	Capital expenditures(ii)		Depreciation, depletion and amortization	Capital expenditures(ii)		Depreciation, depletion and amortization	Capital expenditures(ii)		Depreciation, depletion and amortization
Sustaining capital	Project execution	Sustaining capital		Project execution	Sustaining capital		Project execution		
Ferrous minerals	1,685	385	2,063	1,569	823	1,672	1,194	1,485	1,709
Base metals	1,225	151	1,351	1,189	34	1,351	960	50	1,590
Coal	240	–	237	132	24	252	73	45	296
Others	10	8	75	6	7	76	4	20	113
Total	3,160	544	3,726	2,896	888	3,351	2,231	1,600	3,708

- (i) Goodwill is allocated mainly to ferrous minerals and base metals segments in the amount of US\$1,770 and US\$1,859 in December 31, 2019 and US\$1,841 and US\$1,812 in December 31, 2018, respectively.
- (ii) Cash outflows.

c) Assets by geographic area

	December 31, 2019				December 31, 2018			
	Investments in associates and joint ventures	Intangible	Property, plant and equipment	Total	Investments in associates and joint ventures	Intangible	Property, plant and equipment	Total
Brazil	2,498	6,496	29,134	38,128	2,604	5,875	29,226	37,705
Canada	–	2,000	10,733	12,733	–	1,956	9,905	11,861
Americas, except Brazil and Canada	242	–	–	242	247	–	–	247
Europe	–	2	900	902	–	–	366	366
Indonesia	–	1	2,761	2,762	–	1	2,776	2,777
Asia, except Indonesia	58	–	995	1,053	374	–	1,025	1,399
New Caledonia	–	–	604	604	–	–	2,796	2,796
Mozambique	–	–	–	–	–	130	1,459	1,589
Oman	–	–	1,449	1,449	–	–	829	829
Other regions	–	–	–	–	–	–	3	3
Total	2,798	8,499	46,576	57,873	3,225	7,962	48,385	59,572



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

d) Net operating revenue by geographic area

	Year ended December 31, 2019				
	Ferrous minerals	Base metals	Coal	Others	Total
Americas, except United States and Brazil	523	835	–	–	1,358
United States of America	404	931	–	–	1,335
Germany	1,161	522	–	–	1,683
Europe, except Germany	1,514	1,715	282	–	3,511
Middle East, Africa and Oceania	2,083	20	75	–	2,178
Japan	2,057	426	120	–	2,603
China	17,572	670	–	–	18,242
Asia, except Japan and China	2,032	816	464	–	3,312
Brazil	2,659	226	80	383	3,348
Net operating revenue	30,005	6,161	1,021	383	37,570

	Year ended December 31, 2018				
	Ferrous minerals	Base metals	Coal	Others	Total
Americas, except United States and Brazil	820	658	–	–	1,478
United States of America	388	952	–	13	1,353
Germany	1,130	523	–	–	1,653
Europe, except Germany	2,218	1,800	436	–	4,454
Middle East, Africa and Oceania	2,562	25	151	–	2,738
Japan	2,072	508	163	–	2,743
China	14,381	861	–	–	15,242
Asia, except Japan and China	1,798	1,101	767	–	3,666
Brazil	2,564	275	126	283	3,248
Net operating revenue	27,933	6,703	1,643	296	36,575

	Year ended December 31, 2017				
	Ferrous minerals	Base metals	Coal	Others	Total
Americas, except United States and Brazil	593	1,009	–	70	1,672
United States of America	355	872	–	83	1,310
Germany	1,097	292	–	–	1,389
Europe, except Germany	1,721	1,985	396	11	4,113
Middle East, Africa and Oceania	1,768	13	171	–	1,952
Japan	1,927	399	130	–	2,456
China	13,442	576	–	–	14,018
Asia, except Japan and China	1,332	1,539	711	–	3,582
Brazil	2,894	186	159	236	3,475
Net operating revenue	25,129	6,871	1,567	400	33,967

Provisionally priced commodities sales—The commodity price risk arises from volatility of iron ore, nickel, copper and coal prices. The Company is mostly exposed to the fluctuations in the iron ore and copper

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

4. Information by business segment and by geographic area (Continued)

price. The selling price of these products can be measured reliably at each period, since the price is quoted in an active market. The final price of these sales will be determined during the first quarter of 2020.

The sensitivity of the Company's risk on final settlement of its provisionally priced accounts receivables are presented below:

	December 31, 2019			
	Thousand metric tons	Provisional price (US\$/tonne)	Change	Effect on Revenue
Iron ore	14,756	90.3	+/-10%	133
Iron ore pellets	537	91.2	+/-10%	5
Copper	99	7,827.0	+/-10%	78

Accounting policy

Revenue is recognized when the control of a good or service transferred to a customer. Since Vale's sales are under different shipping terms, revenue could be recognized when the product is available at the loading port, loaded on the ship, at the port of discharge or at the customer's warehouse.

A relevant proportion of Vale's sales are under Cost and Freight ("CFR") and Cost, Insurance and Freight ("CIF") Incoterms, in which the Company is responsible for providing shipping services after the date that Vale transfers control of the goods to the customers. Shipping services for CFR and CIF contracts are considered as a separate performance obligation in which a proportion of the transaction price is allocated and recognized over time as the shipping services are provided.

Generally, the contract payment terms consider the upfront payments or the use of credit letters. The payment terms do not have a significant financing component. In some cases, the sale price is determined on a provisional basis at the date of sale and adjustments to the sale price subsequently occur based on movements in the quoted market or contractual prices up to the date of final pricing.

Revenue is recognized based on the estimated fair value of the total consideration receivable, and the provisionally priced sale mechanism embedded within these sale arrangements has the character of a derivative. Accordingly, the fair value of the final sale price adjustment is re-estimated continuously and changes in fair value are recognized as operational revenue in the income statement.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

5. Costs and expenses by nature

a) Cost of goods sold and services rendered

	Year ended December 31		
	2019	2018	2017
Personnel	2,009	2,278	2,295
Materials and services	3,873	3,957	3,814
Fuel oil and gas	1,392	1,538	1,313
Maintenance	2,797	2,807	3,096
Energy	858	906	963
Acquisition of products	608	513	543
Depreciation and depletion	3,399	3,207	3,484
Freight	4,023	4,306	3,346
Others	2,228	2,597	2,185
Total	21,187	22,109	21,039
Cost of goods sold	20,498	21,526	20,426
Cost of services rendered	689	583	613
Total	21,187	22,109	21,039

b) Selling and administrative expenses

	Year ended December 31		
	2019	2018	2017
Selling	92	95	68
Personnel	181	212	234
Services	85	92	77
Depreciation and amortization	56	62	91
Others	73	62	61
Total	487	523	531

c) Other operating expenses, net

	Year ended December 31		
	2019	2018	2017
Provision for litigations(i)	291	185	169
Profit sharing program(ii)	89	187	149
Disposals of materials and inventories	47	32	17
Others	78	41	85
Total	505	445	420

- (i) Includes the change in the expected outcome of probable loss of the lawsuit related to the accident of ship loaders, at the Praia Mole maritime terminal, in Espírito Santo, for the year ended December 31, 2019.
- (ii) Refers to profit sharing program for eligible employees. The payments related to the profit sharing of the executives are suspended, due to the Brumadinho event described in note 3.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

6. Financial result

	Year ended December 31		
	2019	2018	2017
Financial income			
Short-term investments	247	177	176
Others	280	246	302
	527	423	478
Financial expenses			
Loans and borrowings gross interest	(989)	(1,185)	(1,697)
Capitalized loans and borrowing costs	140	194	370
Participative stockholders' debentures	(1,475)	(550)	(625)
Interest on REFIS	(154)	(197)	(397)
Interest on lease liabilities	(76)	-	-
Financial guarantees(i)	(353)	23	(222)
Expenses with cash tender offer repurchased	(265)	(273)	(186)
Others	(634)	(357)	(516)
	(3,806)	(2,345)	(3,273)
Other financial items, net			
Net foreign exchange gains (losses)—Loans and borrowings	(111)	(2,666)	(249)
Derivative financial instruments	244	(266)	454
Other foreign exchange gains (losses), net	150	419	(218)
Indexation losses, net	(417)	(522)	(211)
	(134)	(3,035)	(224)
Total	(3,413)	(4,957)	(3,019)

(i) In 2019, the Company reassessed the credit risk of certain associates and joint ventures (note 32).

Net investment of foreign operation

Since January 1, 2019, the Company has considered certain long-term loans payable to Vale International S.A., for which settlement is neither planned nor likely to occur in the foreseeable future, as part of its net investment in that foreign operation. The foreign exchange differences arising on the monetary item are recognized in other comprehensive income, in the "Cumulative translation adjustments", and reclassified from stockholders' equity to income statement at the moment of the disposal or partial disposal of the net investment. The Company recognized a loss of US\$483 (US\$319 net of taxes) for the year ended December 31, 2019, in the "Cumulative translation adjustments" in stockholders' equity.

Accounting policy

Transactions in foreign currencies are translated into the functional currency using the exchange rate prevailing at the transaction date. The foreign exchange gains and losses resulting from the translation at the exchange rates prevailing at the end of the year are recognized in the income statement as "financial income or expense". The exceptions are transactions related to qualifying net investment hedges or items that are attributable to part of the net investment in a foreign operation, for which gains and losses are recognized in the statement of comprehensive income.

Notes to the Financial Statements (Continued)
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7. Streaming transactions

Cobalt streaming

In June 2018, the Company entered into two different agreements, one with Wheaton Precious Metals Corp (“Wheaton”) and the other with Cobalt 27 Capital Corp. (“Cobalt 27”), to sell a stream equivalent to 75% of the cobalt extracted as a by-product from the Voisey’s Bay mine, in Canada, starting on January 1, 2021. Upon completion of the transaction, the Company received an upfront payment of US\$690 in cash (US\$390 from Wheaton and US\$300 from Cobalt 27), which has been recorded as “streaming transactions” in the non-current liabilities. Vale will receive additional payments of 20%, on average, of the market reference price for cobalt, for each pound of finished cobalt delivered.

Gold streaming

In August 2016, the Company amended the gold transaction entered into in 2013 with Wheaton Precious Metals Corp (“Wheaton”) to include in each contract an additional 25% of the gold extracted as by-product over a lifetime of the Salobo copper mine. Hence, Wheaton holds the rights to 75% of the contained gold in the copper concentrated from the Salobo mine and 70% of the gold extracted as a by-product of the Sudbury nickel mines.

The transactions were bifurcated into two identifiable components (i) the sale of the mineral rights recognized in the income statement under “Other operating income (expenses), net” and, (ii) the contract liability related to the services for gold extraction on the portion in which Vale operates as an agent for Wheaton gold extraction.

Accounting policy

The Company recognizes contract liabilities in the event it receives payments from customers before a sale meets criteria for revenue recognition. Proceeds received under the terms of the streaming transaction are accounted for as “streaming transactions” and included within liabilities.

Contract liability is initially recognized at fair value, net of transaction costs incurred, and is subsequently carried at amortized cost and updated using the effective interest rate method. Contract liability is released in the income statement as the control of the product or service is transferred to the customer.

Critical accounting estimates and judgments

Defining the gain on sale of mineral interest and the contract liabilities portion of the gold transaction requires the use of critical accounting estimates including, but not limited to: (i) allocation of costs between nickel or copper and gold based on relative prices; (ii) expected margin for the independent components (sale of mineral rights and service for gold extraction); and (iii) discount rates used to measure the present value of future inflows and outflows.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

8. Income taxes

a) Deferred income tax assets and liabilities

	December 31, 2019	December 31, 2018
Taxes losses carryforward	4,659	4,882
Temporary differences:		
Employee post retirement obligations	840	674
Provision for litigation	443	409
Timing differences arising on assets and liabilities(i)	3,246	1,253
Fair value of financial instruments	864	538
Allocated goodwill	(2,640)	(2,328)
Others	(77)	(52)
	<u>2,676</u>	<u>494</u>
Total	<u>7,335</u>	<u>5,376</u>
Assets	9,217	6,908
Liabilities	(1,882)	(1,532)
	<u>7,335</u>	<u>5,376</u>

(i) The changes refer mainly to the recognition of the tax effects of the Brumadinho event in 2019.

Changes in deferred tax are as follows:

	Assets	Liabilities	Deferred taxes, net
Balance at December 31, 2017	<u>6,638</u>	<u>1,719</u>	<u>4,919</u>
Taxes losses carryforward	665	-	665
Timing differences arising on assets and liabilities	152	-	152
Fair value of financial instruments	147	-	147
Allocated goodwill	-	(37)	37
Others	(77)	-	(77)
Effect in income statement	887	(37)	924
Transfers between asset and liabilities	(70)	(70)	-
Translation adjustment	(673)	(102)	(571)
Other comprehensive income	123	22	101
Effect of discontinued operations			
Effect in income statement	14	-	14
Transfer to net assets held for sale	(11)	-	(11)
Balance at December 31, 2018	<u>6,908</u>	<u>1,532</u>	<u>5,376</u>
Utilization of taxes losses carryforward	(443)	-	(443)
Timing differences arising on assets and liabilities	2,113	-	2,113
Fair value of financial instruments	328	-	328
Allocated goodwill	-	(210)	210
Others	(91)	-	(91)
Effect in income statement	1,907	(210)	2,117
Transfers between asset and liabilities	252	252	-
Acquisition of subsidiaries(i)	104	250	(146)
Translation adjustment	(187)	47	(234)
Other comprehensive income	233	11	222
Balance at December 31, 2019	<u>9,217</u>	<u>1,882</u>	<u>7,335</u>

(i) Refers to the acquisition of New Steel and Ferrous Resources Limited (note 14).

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

8. Income taxes (Continued)

The tax loss carryforward does not expire in the Brazilian jurisdiction and their compensation is limited to 30% of the taxable income for the year. The local profits of subsidiaries abroad are also taxed in Brazil and there is no restriction on their offset against tax losses generated previously by the foreign entity or by the Parent Company.

b) Income tax reconciliation—Income statement

The total amount presented as income taxes in the income statement is reconciled to the statutory rate, as follows:

	Year ended December 31		
	2019	2018	2017
Income (loss) before income taxes	(2,775)	6,816	7,829
Income taxes at statutory rate—34%	944	(2,317)	(2,662)
Adjustments that affect the basis of taxes:			
Income tax benefit from interest on stockholders' equity	601	873	728
Tax incentives	189	576	372
Equity results	77	104	35
Additions of tax loss carryforward	25	1,510	99
Unrecognized tax losses of the year	(1,059)	(458)	(432)
Nondeductible effect of impairment	-	(24)	(43)
Others	(182)	(92)	408
Income taxes	595	172	(1,495)

c) Tax incentives

In Brazil, Vale has tax incentives to partially reduce the income tax generated by the operations conducted in the North and Northeast regions that includes iron ore, pellets, manganese, copper and nickel. The incentive is calculated based on the taxable income of the incentive activity (tax operating income) and takes into account the allocation of tax operating income into different incentives applicable to different tranches of production during the periods specified for each product, usually 10 years. Most of the Company's incentives are expected to expire up to 2024 and the last recognized tax incentive will expire in 2027. An amount equal to that obtained with the tax saving must be appropriated in retained earnings reserve account in stockholders' equity, and cannot be distributed as dividends to stockholders.

In addition to those incentives, the amount equivalent to 30% of the income tax due, can be reinvested in the acquisition of new machinery and equipment, subject to subsequent approval by the regulatory agency responsible, Superintendência de Desenvolvimento da Amazônia ("SUDAM") and/or the Superintendência de Desenvolvimento do Nordeste ("SUDENE"). The reinvestment subsidy is accounted in retained earnings reserve account, which restricts the distribution as dividends to stockholders. This tax incentive will expire in 2023.

Vale is subject to the revision of income tax by local tax authorities in a range up to 10 years depending on jurisdiction where the Company operates.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

8. Income taxes (Continued)

d) Income taxes—Settlement program (“REFIS”)

The balance mainly relates to REFIS to settle most of the claims related to the collection of income tax and social contribution on equity gains of foreign subsidiaries and affiliates from 2003 to 2012. At December 31, 2019, the balance of US\$3,907 (US\$431 classified as current liabilities and US\$3,476 classified as non-current liabilities) is due in 106 remaining monthly installments, bearing the SELIC interest rate (Special System for Settlement and Custody), which is the Brazilian federal funds rate, while at December 31, 2018, the balance was US\$4,349 (US\$432 classified as current liabilities and US\$3,917 classified as non-current liabilities).

As at December 31, 2019, the SELIC rate was 4.50% per annum (6.50% per annum at December 31, 2018).

e) Uncertain tax positions

In 2004, a decision of the Federal Court of Appeals of the 2nd Region (“TRF”) granted to the Company the right to deduct the social security contributions on the net income (“CSLL”) from the taxable corporate income. In 2006, the Brazilian federal tax authorities commenced a rescission action (ação rescisória), seeking the reversal of the 2004 decision. In 2019, “TRF” decided in favour for the rescission action. Following this decision, the Company has filed a motion for clarification and a decision is pending.

Due to the recent developments on this proceeding, the Company has decided to not deduct the “CSLL” from the taxable income prospectively from the 2019 year end. Until December 31, 2018 the uncertainties associated to the deduction of the “CSLL” from the taxable corporate income totaled US\$194 (R\$783 million) and are not provisioned. The Company determined that, based on its internal and external experts, it is probable that the Company’s treatments will be accepted by the Brazilian tax authority.

The Company did not identify any other uncertain tax treatments that could result in a liability material to the Company, however, Vale remains subject to income tax examinations for its income taxes generally for fiscal the years from 2014 through 2019.

Accounting policy

The Brazilian corporate tax law requires the taxation on the income generated from foreign subsidiaries and, therefore, income tax charge is calculated using the tax rate enacted at the end of the reporting period in Brazil. The effects of the income tax calculation in the consolidated financial statements are calculated by applying the differential between the Brazilian income tax rate and the local income tax rate of each jurisdiction where the Company’s subsidiaries operate and generate taxable income.

Management periodically evaluates positions taken in tax returns with respect to situations in which applicable tax regulation is subject to interpretation and it establishes provisions, where appropriate, on the basis of amounts expected to be paid to the tax authorities. The benefits of uncertain tax positions are recorded only after determining a more-likely-than-not probability that the uncertain tax positions will withstand challenge, if any, from taxing authorities.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

8. Income taxes (Continued)

Deferred income taxes are recognized based on temporary differences between carrying amount and the tax basis of assets and liabilities as well as tax losses carryforwards. However, deferred tax liabilities are not recognized if they arise from the initial recognition of goodwill. Deferred income tax is also not accounted for if it arises from initial recognition of an asset or liability in a transaction other than a business combination that, at the time of the transaction, affects neither accounting nor taxable profit or loss. Deferred tax assets and liabilities are offset where there is a legally enforceable right to offset current tax assets and liabilities and where the deferred tax balances relate to the same taxation authority.

The deferred tax assets arising from tax losses and temporary differences are not recognized when it is not probable that future taxable profit will be available against which temporary differences and/or tax losses can be utilized.

Current and deferred tax is recognized in profit or loss, except to the extent that it relates to items recognized in other comprehensive income or directly in stockholder's equity. In this case, the tax is also recognized in other comprehensive income or directly in stockholder's equity, respectively.

Critical accounting estimates and judgments

Significant judgements, estimates and assumptions are required to determine the amount of deferred tax assets that are recognized based on the likely timing and future taxable profits. Deferred tax assets arising from tax losses carryforwards and temporary differences are recognized considering assumptions and projected cash flows. Deferred tax assets may be affected by factors including, but not limited to: (i) internal assumptions on the projected taxable income, which are based on production and sales planning, commodity prices, operational costs and planned capital costs; (ii) macroeconomic environment; and (iii) trade and tax scenarios.

In addition, the Company applies significant judgement in identifying uncertainties over income tax treatments, which could impact the consolidated financial statements. The Company operates in multiple jurisdictions where uncertainties arise in the application of complex tax regulations. Vale and its subsidiaries are subject to reviews of income tax filings and other tax payments, and disputes can arise with the taxing authorities over the interpretation of the applicable laws and regulations.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

9. Basic and diluted earnings (loss) per share

The basic and diluted earnings (loss) per share are presented below:

	Year ended December 31		
	2019	2018	2017
Net income (loss) attributable to Vale's stockholders:			
Net income (loss) from continuing operations	(1,683)	6,952	6,313
Loss from discontinued operations	-	(92)	(806)
Net income (loss)	(1,683)	6,860	5,507
Thousands of shares			
Weighted average number of shares outstanding—common shares	5,127,950	5,178,024	5,197,432
Basic and diluted earnings (loss) per share from continuing operations:			
Common share (US\$)	(0.33)	1.34	1.21
Basic and diluted loss per share from discontinued operations:			
Common share (US\$)	-	(0.02)	(0.16)
Basic and diluted earnings (loss) per share:			
Common share (US\$)	(0.33)	1.32	1.05

The Company does not have potential outstanding shares or other instruments with dilutive effect on the earnings per share computation.

10. Accounts receivable

	December 31, 2019	December 31, 2018
Accounts receivable	2,592	2,710
Expected credit loss	(63)	(62)
	2,529	2,648
Revenue related to the steel sector—%	87.33%	85.50%

	Year ended December 31		
	2019	2018	2017
Impairment of accounts receivable recorded in the income statement ..	(1)	(7)	(4)

There is no customer that individually represents more than 10% of the Company's accounts receivable or revenues.

Accounting policy

Accounts receivable is the total amount due from sale of products and services rendered by the Company. Accounts receivable is recognized at fair value and subsequently measured at amortized cost using the effective interest method, except for component of provisionally priced commodities sales that are subsequently measured at fair value through profit or loss.

The Company applies the IFRS 9 simplified approach to measuring expected credit losses which uses a lifetime expected loss allowance for all accounts receivable. The Company has established a provision matrix that is based on historical credit loss experience, adjusted for forward-looking factors specific to the economic environment and by any financial guarantees related to these accounts receivables.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

11. Inventories

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
Finished products	2,604	2,797
Work in progress	767	690
Consumable inventory	903	956
Total	<u>4,274</u>	<u>4,443</u>

	<u>Year ended December 31</u>		
	<u>2019</u>	<u>2018</u>	<u>2017</u>
Provision (reversal) for net realizable value	24	(4)	86

Finished and work in progress products inventories by segments are presented in note 4(b).

Accounting policy

Inventories are stated at the lower of cost and the net realizable value. The inventory production cost comprises variable and fixed costs, direct and indirect costs of production and are assigned to individual items of inventory on the basis of weighted average costs method. At the end of the reporting period, net realizable value of inventories are assessed and a provision for losses on obsolete or slow-moving inventory may be recognized. The write-downs and reversals are recognized as "Cost of goods sold and services rendered".

12. Recoverable taxes

Recoverable taxes are presented net of provisions for losses on tax credits.

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
Value-added tax	484	813
Brazilian federal contributions	659	808
Others	16	13
Total	<u>1,159</u>	<u>1,634</u>
Current	552	883
Non-current	607	751
Total	<u>1,159</u>	<u>1,634</u>

The balance of the provision for loss of value-added tax are presented below:

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
Provision for loss	1,124	700

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

13. Other financial assets and liabilities

	Current		Non-Current	
	December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2018
Other financial assets				
Assets held for sale (note 14b)	152	-	-	-
Bank accounts restricted	-	-	125	-
Loans	-	-	87	153
Derivative financial instruments (note 25)	288	39	184	392
Investments in equity securities (note 14)	-	-	726	987
Related parties—Loans (note 31)	319	364	1,600	1,612
	<u>759</u>	<u>403</u>	<u>2,722</u>	<u>3,144</u>
Other financial liabilities				
Derivative financial instruments (note 25)	94	470	307	344
Related parties—Loans (note 31)	980	1,134	956	960
Financial guarantees (note 32)	-	-	525	166
Participative stockholders' debentures ...	-	-	2,584	1,407
	<u>1,074</u>	<u>1,604</u>	<u>4,372</u>	<u>2,877</u>

Participative stockholders' debentures

At the time of its privatization in 1997, the Company issued debentures to then-existing stockholders, including the Brazilian Government. The debentures' terms were set to ensure that pre-privatization stockholders would participate in potential future benefits that might be obtained from exploration of mineral resources. A total of 388,559,056 debentures were issued with a par value of R\$0.01 (one cent of Brazilian Real) and are inflation-indexed to the General Market Price Index ("IGP-M"), as set forth in the Issue Deed.

Holders of participative stockholders' debentures have the right to receive semi-annual payments equal to an agreed percentage of revenues less value-added tax, transport fee and insurance expenses related to the trading of the products, from certain identified mineral resources that the Company owned at the time of the privatization. This obligation will cease when all the relevant mineral resources are exhausted, sold or otherwise disposed of by the Company. The Company made available for withdrawal as remuneration the amount of US\$195 and US\$148, respectively, for the year ended December 31, 2019 and 2018.

14. Acquisitions and divestitures

a) Business combinations

Ferrous Resources Limited—On August 1, 2019 the Company acquired 100% of the share capital of Ferrous Resources Limited ("Ferrous"), a company that currently owns and operates iron ore mines nearby some Company's operations in Minas Gerais, Brazil for cash consideration of US\$525. Ferrous has been acquired to gain access to additional reserves for the Company.



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

14. Acquisitions and divestitures (Continued)

The fair values of identifiable assets acquired and liabilities assumed as a result of the acquisition are as follows:

	<u>August 1, 2019</u>
Acquired assets	706
Cash and cash equivalents	95
Accounts receivable	29
Inventories	10
Intangibles	5
Property, plant and equipment	427
Others	140
Assumed liabilities	(216)
Net identifiable assets acquired	490
Fair value adjustment on PP&E	52
Deferred tax liability	(17)
Total identifiable net assets at fair value	525
	<u>August 1, 2019</u>
Cash consideration transferred	525
(-) Balances acquired	
Cash and cash equivalents	95
Net cash outflow	430

New Steel—On January 24, 2019 the Company acquired 100% of the share capital of New Steel Global N.V. (“New Steel”) and gained its control for the total cash consideration of US\$496. New Steel is a company that develops processing and beneficiating technologies for iron ore through a completely dry process.

The consideration paid is mainly attributable to the research and development project for processing and beneficiating iron ore, which is expected to be used on the Company’s pelletizing operation. The intangible assets are not subject to amortization until the operational phase is reached. Instead, they are tested for impairment annually, or more frequently when a trigger for impairment has been identified.

The fair values of identifiable assets acquired and liabilities assumed as a result of the acquisition are as follows:

	<u>January 24, 2019</u>
Acquired assets	18
Intangibles (note 18)	1
Other assets	17
Net identifiable assets acquired	18
Fair value adjustment of intangible research and development asset (note 18)	723
Deferred tax liability	(245)
Total identifiable net assets at fair value	496



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

14. Acquisitions and divestitures (Continued)

b) Other acquisitions and divestitures

Henan Longyu—On December 27, 2019 the Company entered into an agreement to sell its 25% interest in Henan Longyu Energy Resources Co., Ltd, a company that operates two coal mines in the province of Henan, China, for the total consideration of US\$152. The closing is expected for the first quarter of 2020 upon completion of conditions precedent. The investment is classified as held for sale as “other financial assets” on current assets. The Company has identified a subsequent event in relation to the divestment of Henan Longyu, which is disclosed on note 34.

MBR—On December 20, 2019, the Company purchased an additional 36.4% interest in Minerações Brasileiras Reunidas S.A. (“MBR”) held by its related party, for the total consideration of US\$812 (R\$3,309 million). Following the completion of the transaction, the Company holds 98.3% of MBR’s share capital. Since this transaction did not result in a change of control for the Company, the impact of US\$343 arising from the purchase of additional shares was recognized in the Company’s stockholders’ equity, as “Acquisitions and disposal of noncontrolling interest”.

Divestment agreement in compliance with PTVI’s Contract of Work—The Company’s subsidiary, PT Vale Indonesia Tbk (“PTVI”), a public company in Indonesia, has an agreement in place dated October 17, 2014 with the government of the Republic of Indonesia to operate its mining licenses which includes a commitment to divest an additional 20% of PTVI’s shares to Indonesian participants (approximately 20% of PTVI’s shares are already registered on the Indonesian Stock Exchange—IDX).

The existing major shareholders, Vale and Sumitomo Metal Mining, Co., Ltd. (“SMM”) hold 58.7% and 20.1%, respectively, of PTVI’s issued shares. Vale and SMM have signed a Heads of Agreement with PT Indonesia Asahan Aluminium (“Inalum”), an Indonesian state-owned company, to satisfy the 20% interest divestment obligation in relation to PTVI, proportionally to their interest. Following the transaction, Vale and SMM will hold together approximately 59% of PTVI’s shares.

The Company expects to set and sign the final terms and conditions in the first quarter of 2020 and complete its divestment within six months from the execution of the divestment agreement. The Company has identified a subsequent event in relation to the divestment obligation, which is disclosed on note 34.

Fertilizers (discontinued operations)—In January 2018, the Company and The Mosaic Company (“Mosaic”) concluded the transaction entered in December 2016, to sell (i) the phosphate assets located in Brazil, except for those located in Cubatão, Brazil; (ii) the control of Compañia Minera Miski Mayo S.A.C., in Peru; (iii) the potassium assets located in Brazil; and (iv) the potash projects in Canada.

The Company received US\$1,080 in cash and 34.2 million common shares, corresponding to 8.9% of Mosaic’s outstanding common shares after the issuance of these shares totaling US\$899, based on the Mosaic’s quotation at closing date of the transaction and a loss of US\$55 was recognized in the income statement from discontinued operations. Mosaic’s shares received have been accounted for as a financial investment measured at fair value through other comprehensive income.



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

14. Acquisitions and divestitures (Continued)

In May 2018, the Company concluded the transaction entered with Yara International ASA to sell its assets located in Cubatão, Brazil and received US\$255 in cash and a loss of US\$69 was recognized in the income statement from discontinued operations.

The results for the years and the cash flows of discontinued operations are presented as follows:

Income statement

	Year ended December 31	
	2018	2017
Discontinued operations		
Net operating revenue	121	1,746
Cost of goods sold and services rendered	(120)	(1,605)
Operating expenses	(4)	(141)
Impairment of non-current assets	(124)	(885)
Operating loss	(127)	(885)
Financial Results, net	(5)	(28)
Equity results in associates and joint ventures	-	(2)
Loss before income taxes	(132)	(915)
Income taxes	40	102
Loss from discontinued operations	(92)	(813)
Loss attributable to noncontrolling interests	-	(7)
Loss attributable to Vale's stockholders	(92)	(806)

Statement of cash flow

	Year ended December 31	
	2018	2017
Discontinued operations		
Net cash provided by (used in) operating activities	(37)	87
Net cash used in investing activities	(9)	(305)
Net cash used in financing activities	-	(34)
Net cash used in discontinued operations	(46)	(252)

Nacala Logistic Corridor—In March 2017, the Company concluded the transaction with Mitsui & Co., Ltd. ("Mitsui") to transfer 50% of its stake of 66.7% in Nacala Logistic Corridor, which comprises entities that holds railroads and port concessions located in Mozambique and Malawi, and sell 15% participation in the holding entity of Vale Moçambique, which holds the Moatize Coal Project, for the amount of US\$690.

As a consequence of sharing control of Nacala BV, the Company recognized a gain of US\$447 in the income statement related to the sale and the re-measurement at fair value, of its remaining interest at Nacala BV based on the consideration received. The consideration received was recognized in the

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

14. Acquisitions and divestitures (Continued)

statement of cash flows in “Proceeds from disposal of assets and investments” in the amount of US\$435 and “Transactions with noncontrolling stockholders” in the amount of US\$255.

After the conclusion of the transaction, Vale has outstanding loan balances with the related parties Nacala BV and Pangea Emirates Ltd due to the deconsolidation of Nacala Logistic Corridor as disclosed in note 31.

Accounting policy

Business combination—The acquisition method of accounting is used to account for all business combinations, regardless of whether equity instruments or other assets are acquired. The consideration transferred for the acquisition of a subsidiary comprises (i) fair values of the assets transferred; (ii) liabilities assumed of the acquired business; (iii) equity interests issued to the Company; (iv) fair value of any asset or liability resulting from a contingent consideration arrangement, and (v) fair value of any pre-existing equity interest in the subsidiary.

Identifiable assets acquired, and liabilities and contingent liabilities assumed in a business combination are, with limited exceptions, measured initially at their fair values at the acquisition date. The Company recognizes any non-controlling interest in the acquired entity on an acquisition-by-acquisition basis either at fair value or at the non-controlling interest's proportionate share of the acquired entity's net identifiable assets.

Discontinued operation—The classification as a discontinued operation occurs through disposal, or when the operation meets the criteria to be classified as held for sale if this occurs earlier. A discontinued operation is a component of a Company business comprising cash flows and operations that may be clearly distinct from the rest of the Company and that represents an important separate line of business or geographical area of operations.

The result of discontinued operations is presented in a single amount in the income statement, including the results after income tax of these operations less any impairment loss. Cash flows attributable to operating, investing and financing activities of discontinued operations are disclosed in a separate note.

When an operation is classified as a discontinued operation, the income statements of the prior periods are restated as if the operation had been discontinued since the beginning of the comparative period.

Any noncontrolling interest relating to a group disposal held for sale is presented in the stockholders' equity and is not reclassified in the statement of financial position.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

15. Subsidiaries

The significant consolidated entities in each business segment are as follows:

	Location	Main activity/Business	% Ownership	% Voting capital	% Noncontrolling interest
Direct and indirect subsidiaries					
Companhia Portuária da Baía de Sepetiba	Brazil	Iron ore	100.0%	100.0%	0.0%
Ferrous Resource Limited	Isle of Man	Iron Ore	100.0%	100.0%	0.0%
Mineração Corumbaense Reunida S.A.	Brazil	Iron ore and manganese	100.0%	100.0%	0.0%
Minerações Brasileiras Reunidas S.A. ("MBR")	Brazil	Iron ore	98.3%	98.3%	1.7%
New Steel Global	Netherlands	Iron ore	100.0%	100.0%	0.0%
Salobo Metais S.A.	Brazil	Copper	100.0%	100.0%	0.0%
PT Vale Indonesia	Indonesia	Nickel	59.2%	59.2%	40.8%
Vale Holdings B.V(i)	Netherlands	Holding and research	100.0%	100.0%	0.0%
Vale Canada Limited	Canada	Nickel	100.0%	100.0%	0.0%
Vale International S.A.	Switzerland	Trading and holding	100.0%	100.0%	0.0%
Vale Malaysia Minerals Sdn. Bhd.	Malaysia	Iron ore	100.0%	100.0%	0.0%
Vale Manganês S.A.	Brazil	Manganese and ferroalloys	100.0%	100.0%	0.0%
Vale Moçambique S.A.	Mozambique	Coal	80.7%	80.7%	19.3%
Vale Nouvelle Calédonie S.A.S.	New Caledonia	Nickel	95.0%	95.0%	5.0%
Vale Newfoundland & Labrador Ltd	Canada	Nickel	100.0%	100.0%	0.0%
Vale Oman Distribution Center LLC	Oman	Iron ore and pelletizing	100.0%	100.0%	0.0%
Vale Oman Pelletizing Company LLC	Oman	Pelletizing	70.0%	70.0%	30.0%
Vale Shipping Holding Pte. Ltd.	Singapore	Iron ore	100.0%	100.0%	0.0%

(i) Vale International Holdings GmbH was merged into Vale Holdings B.V on November 01, 2019.

As explained in note 14, the Fertilizer Segment is presented as discontinued operations, which includes the following subsidiaries:

	Location	Main activity/Business	% Ownership	% Voting capital	% Noncontrolling interest
Direct and indirect subsidiaries					
Compañía Minera Miski Mayo S.A.C.	Peru	Fertilizers	40.0%	51.0%	60.0%
Vale Fertilizantes S.A.	Brazil	Fertilizers	100.0%	100.0%	0.0%
Vale Cubatão Fertilizantes Ltda.	Brazil	Fertilizers	100.0%	100.0%	0.0%

Accounting policy

Consolidation and investments in associates and joint ventures—The financial statements reflect the assets, liabilities and transactions of the Parent Company and its direct and indirect controlled entities ("subsidiaries"). The subsidiaries are consolidated when the Company is exposed or has rights to variable returns from its involvement with the investee and has the ability to direct the significant activities of the investee. Intercompany balances and transactions, which include unrealized profits, are eliminated.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

15. Subsidiaries (Continued)

The entities over which the Company has joint control (“joint ventures”) or significant influence, but not control (“associates”) are presented in note 16. Those investments are accounted for using the equity method. For interests in joint arrangements not classified as joint ventures (“joint operations”), the Company recognizes its share of assets, liabilities and net income.

Unrealized gains on downstream or upstream transactions between the Company and its associates and joint ventures are eliminated proportionately to the Company’s interest.

Investments held by other investors in Vale’s subsidiaries are classified as noncontrolling interests (“NCI”). The Company treats transactions with noncontrolling interests as transactions with equity owners of the Company as described in note 17.

For purchases or disposals from noncontrolling interests, the difference between the consideration paid and the proportion acquired of the carrying value of net assets of the subsidiary is directly recorded in stockholders’ equity in “Results from operation with noncontrolling interest”.

Translation from the functional currency to the presentation currency—The income statement and statement of financial position of the subsidiaries for which the functional currency is different from the presentation currency are translated into the presentation currency as follows: (i) assets, liabilities and stockholders’ equity, except for the components described in item (iii) are translated at the closing rate at the statement of financial position date; (ii) income and expenses are translated at the average exchange rates, except for specific significant transactions that, are translated at the rate at the transaction date and; (iii) capital, capital reserves and treasury stock are translated at the rate at each transaction date. All resulting exchange differences are recognized directly in the comprehensive income as “translation adjustments”. When a foreign operation is disposed of or sold, foreign exchanges differences that were recognized in equity are recognized in the income of statement.

16. Investments in associates and joint ventures

a) Changes during the year

Changes in investments in associates and joint ventures as follows:

	2019	2018
Balance at January 1st,	3,225	3,568
Additions	76	23
Translation adjustment	(111)	(456)
Equity results in income statement	228	305
Equity results in statement of comprehensive income	(4)	–
Fair value adjustment(i)	(163)	–
Dividends declared	(326)	(291)
Transfer to assets held for sale(i)	(152)	–
Others	25	76
Balance at December 31,	2,798	3,225

(i) Refers to fair value adjustment of the investment in Henan Longyu Energy Resources Co., Ltd., which was transferred later to assets held for sale (note 14).

The amount of investments by segments are presented in note 4(b).



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

16. Investments in associates and joint ventures (Continued)

Associates and joint ventures	% ownership	% voting capital	Investments in associates and joint ventures		Equity results in the income statement			Dividends received		
			December 31, 2019	December 31, 2018	Year ended December 31			Year ended December 31		
			2019	2018	2019	2018	2017	2019	2018	2017
Ferrous minerals										
Baovale Mineração S.A.	50.00	50.00	25	23	4	5	7	-	1	1
Companhia Coreano-Brasileira de Pelotização.....	50.00	50.00	88	104	48	69	50	62	32	19
Companhia Hispano-Brasileira de Pelotização(i)	50.89	50.89	70	83	37	55	41	50	23	16
Companhia Ítalo-Brasileira de Pelotização(i).....	50.90	51.00	65	81	30	60	40	54	32	17
Companhia Nipo-Brasileira de Pelotização(i).....	51.00	51.11	150	148	84	126	93	92	67	29
MRS Logística S.A.....	48.16	46.75	496	496	50	72	69	29	27	29
VLI S.A.....	37.60	37.60	812	857	1	30	29	9	7	19
Zhuhai YPM Pellet Co.	25.00	25.00	23	22	-	-	-	-	-	-
			1,729	1,814	254	417	329	296	189	130
Coal										
Henan Longyu Energy Resources Co., Ltd. (note 14)	25.00	25.00	-	317	(2)	16	20	-	-	-
			-	317	(2)	16	20	-	-	-
Base metals										
Korea Nickel Corp.....	25.00	25.00	14	14	-	1	1	-	-	-
			14	14	-	1	1	-	-	-
Others										
Aliança Geração de Energia S.A.(i).....	55.00	55.00	470	486	31	25	27	28	25	29
Aliança Norte Energia Participações S.A(i)	51.00	51.00	160	162	4	15	(2)	-	-	-
California Steel Industries, Inc.....	50.00	50.00	242	247	23	77	42	29	31	27
Companhia Siderúrgica do Pecém	50.00	50.00	-	-	(69)	(243)	(264)	-	-	-
Mineração Rio do Norte S.A.	40.00	40.00	97	93	15	2	13	-	-	41
Others			86	92	(28)	(5)	(68)	-	-	-
			1,055	1,080	(24)	(129)	(252)	57	56	97
Total			2,798	3,225	228	305	98	353	245	227

(i) Although the Company held a majority of the voting capital, the entities are accounted under the equity method due to the stockholders' agreement where relevant decisions are shared with other parties.

The significant associates and joint ventures of the Company are located in Brazil.



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

16. Investments in associates and joint ventures (Continued)

b) Summarized financial information

The summarized financial information about relevant associates and joint-ventures for the Company are as follow. The stand-alone financial statements of those entities may differ from the financial information reported herein, which is prepared considering Vale's accounting policies.

	December 31, 2019							
	Aliança Geração de Energia	Aliança Norte Energia	CSI	CSP(i)	Pelletizing(ii)	MRS Logística	Nacala Corridor Holding Netherlands B.V.	VLI S.A.
Current assets	215	–	481	438	720	490	384	805
Non-current assets	880	314	344	2,960	315	2,196	4,505	4,507
Total assets	1,095	314	825	3,398	1,035	2,686	4,889	5,312
Current liabilities	99	–	186	985	297	415	516	773
Non-current liabilities	142	–	155	2,675	2	1,242	4,671	2,380
Total liabilities	241	–	341	3,660	299	1,657	5,187	3,153
Stockholders'equity	854	314	484	(262)	736	1,029	(298)	2,159
Net revenue	257	–	997	1,393	583	759	782	1,238
Net income (loss)	57	8	46	(412)	392	103	(49)	2

	December 31, 2018							
	Aliança Geração de Energia	Aliança Norte Energia	CSI	CSP(i)	Pelletizing(ii)	MRS Logística	Nacala Corridor Holding Netherlands B.V.	VLI S.A.
Current assets	186	–	489	693	964	263	380	679
Non-current assets	938	318	360	3,062	296	1,826	4,619	3,938
Total assets	1,124	318	849	3,755	1,260	2,089	4,999	4,617
Current liabilities	83	–	186	970	437	360	277	544
Non-current liabilities	158	–	169	2,785	2	699	4,971	1,795
Total liabilities	241	–	355	3,755	439	1,059	5,248	2,339
Stockholders'equity	883	318	494	–	821	1,030	(249)	2,278
Net revenue	248	–	1,389	1,682	911	927	825	1,253
Net income (loss)	45	30	154	(486)	609	150	7	79

- (i) Companhia Siderúrgica do Pecém ("CSP") is a joint venture and its results are accounted for under the equity method, in which the accumulated losses are capped to the Company's interest in the investee's capital based on the applicable law and requirements. That is, after the investment is reduced to zero, the Company does not recognize further losses nor liabilities associated with the investee.
- (ii) Aggregate entity information: Companhia Coreano-Brasileira de Pelotização, Companhia Hispano-Brasileira de Pelotização, Companhia Ítalo-Brasileira de Pelotização, Companhia Nipo-Brasileira de Pelotização.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

16. Investments in associates and joint ventures (Continued)

Accounting policy

Joint arrangements investments—Joint arrangements are all entities over which the Company has shared control with one or more parties. Joint arrangement investments are classified as either joint operations or joint ventures depending on the contractual rights and obligations of each investor.

The joint operations are recorded in the financial statements to represent the Company's contractual rights and obligations.

Interests in joint ventures are accounted for using the equity method, after initially being recognized at cost. The Company's investment in joint ventures includes the goodwill identified in the acquisition, net of any impairment loss.

The Company's interest in the profits or losses of its joint ventures is recognized in the income statement and participation in the changes in reserves is recognized in the Company's reserves. When the Company's interest in the losses of an associate or joint venture is equal to or greater than the carrying amount of the investment, including any other receivables, the Company does not recognize additional losses, unless it has incurred obligations or made payments on behalf of the joint venture.

Critical accounting estimates and judgments

Judgment is required in some circumstances to determine whether after considering all relevant factors, the Company has either control, joint control or significant influence over an entity. Significant influence includes situations of collective control.

The Company holds the majority of the voting capital in five joint arrangements (Aliança Geração de Energia S.A., Aliança Norte Energia Participações S.A., Companhia Hispano-Brasileira de Pelotização, Companhia Ítalo-Brasileira de Pelotização and Companhia Nipo-Brasileira de Pelotização), but management have concluded that the Company does not have a sufficiently dominant voting interest to have the power to direct the activities of the entity. As a result, these entities are accounted under equity method due to shareholder's agreements where relevant decisions are shared with other parties.

17. Noncontrolling interest

a) Summarized financial information

The summarized financial information, prior to the eliminations of the intercompany balances and transactions, about subsidiaries with material noncontrolling interest are as follow. The stand-alone



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

17. Noncontrolling interest (Continued)

financial statements of those entities may differ from the financial information reported herein, which is prepared considering Vale's accounting policies.

	December 31, 2019				
	PTVI	VNC	Vale Moçambique S.A.	Others	Total
Current assets	462	169	188		
Non-current assets	1,630	604	199		
Related parties—Stockholders	84	34	29		
Total assets	2,176	807	416		
Current liabilities	140	199	320		
Non-current liabilities	61	236	147		
Related parties—Stockholders	-	344	10,221		
Total liabilities	201	779	10,688		
Stockholders' equity	1,975	28	(10,272)		
Equity attributable to noncontrolling interests	806	1	(1,982)	101	(1,074)
Net income (loss)	67	(2,055)	(3,183)		
Net income (loss) attributable to noncontrolling interests	27	(103)	(613)	192	(497)
Dividends paid to noncontrolling interests(i)	-	-	-	184	184

(i) Dividends paid to noncontrolling interests relates to US\$162 to Minerações Brasileiras Reunidas and US\$21 to Vale Oman Pelletizing.

	December 31, 2018					
	MBR	PTVI	VNC	Vale Moçambique S.A.	Others	Total
Current assets	581	465	202	303		
Non-current assets	2,499	1,567	1,922	1,709		
Related parties—Stockholders	721	111	56	22		
Total assets	3,801	2,143	2,180	2,034		
Current liabilities	187	165	141	313		
Non-current liabilities	282	153	256	79		
Related parties—Stockholders	197	-	766	8,731		
Total liabilities	666	318	1,163	9,123		
Stockholders' equity	3,135	1,825	1,017	(7,089)		
Equity attributable to noncontrolling interests	1,254	745	51	(1,290)	87	847
Net income (loss)	434	58	351	(985)		
Net income (loss) attributable to noncontrolling interests	174	24	18	(190)	10	36
Dividends paid to noncontrolling interests(i)	168	-	-	-	14	182

(i) Dividends paid to others noncontrolling interests relates to Vale Oman Pelletizing



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

17. Noncontrolling interest (Continued)

	December 31, 2017						
	MBR	PTVI	VNC	Moçambique Vale S.A.	Compañia Mineradora Miski Mayo S.A.C.(i)	Others	Total
Net income (loss)	434	(15)	(572)	(659)	(11)		
Net income (loss) attributable to noncontrolling interests.....	174	(6)	(28)	(104)	(6)	(16)	14
Dividends paid to noncontrolling interests(ii)	113	-	-	-	-	13	126

(i) Discontinued operations

(ii) Dividends paid to others noncontrolling interests relates to Vale Oman Pelletizing

18. Intangibles

Changes in intangibles are as follows:

	Goodwill	Concessions(i)	Contract right	Software	Research and development project and patents	Total
Balance at December 31, 2017.....	4,110	4,002	152	229	-	8,493
Additions	-	855	-	7	-	862
Disposals.....	-	(27)	-	(2)	-	(29)
Amortization	-	(135)	(2)	(99)	-	(236)
Translation adjustment	(457)	(634)	(13)	(24)	-	(1,128)
Balance at December 31, 2018.....	3,653	4,061	137	111	-	7,962
Cost	3,653	5,043	201	923	-	9,820
Accumulated amortization	-	(982)	(64)	(812)	-	(1,858)
Balance at December 31, 2018.....	3,653	4,061	137	111	-	7,962
Additions	-	439	-	39	-	478
Disposals.....	-	(17)	-	-	-	(17)
Amortization	-	(239)	(2)	(66)	-	(307)
Impairment (note 20).....	-	(112)	-	(11)	-	(123)
Acquisition of subsidiary	-	3	-	1	724	728
Translation adjustment	(24)	(165)	5	2	(40)	(222)
Balance at December 31, 2019.....	3,629	3,970	140	76	684	8,499
Cost	3,629	5,090	248	888	684	10,539
Accumulated amortization	-	(1,120)	(108)	(812)	-	(2,040)
Balance at December 31, 2019.....	3,629	3,970	140	76	684	8,499

(i) Based on technical studies carried out by an independent company and after approval by the regulatory agency (ANTT), the Company reduced the useful life of its railroad tracks in 2019.

a) Goodwill—The goodwill arose from the acquisition of iron ore and nickel businesses. In 2017, the goodwill was recognized on the acquisition of Vale controlling interest by Valepar, based on the expected future returns on the ferrous segment. As the fundamentals are still valid on the date of the merger of Valepar by Vale, the goodwill was fully recognized. The Company has not recognized the deferred taxes

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

18. Intangibles (Continued)

over the goodwill, since there are no differences between the tax basis and accounting basis. The Company assesses annually the recoverable amount of the goodwill.

b) Concessions—The concessions refer to the agreements with governments for the exploration and the development of ports and railways. The Company holds railway concessions which are valid over a certain period of time. Those assets are classified as intangible assets and amortized over the shorter of their useful lives and the concession term at the end of which they will be returned to the government.

The technical studies and legal documents on early extension of the Vitória Minas Railroad (EFVM) and Carajás Railroad (EFC) concessions are currently under review by the Federal Court of Audit. Vale awaits the end of the process in the public sphere to submit the proposal, with the required counterparts, to its Board of Directors.

c) Contract right—Refers to intangible identified in the business combination of Vale Canada Limited (“Vale Canada”) and to the usufruct contract between the Company and noncontrolling stockholders to use the shares of Empreendimentos Brasileiros de Mineração S.A. (owner of Minerações Brasileiras Reunidas S.A. shares). The amortization of the right of use will expire in 2037 and Vale Canada’s intangible will end in September of 2046.

d) Research and development project and patents—Refers to in-process research and development projects and patents identified in the business combination of New Steel Global N.V. (note 14). The intangible assets of research and development are not subject to amortization until the operational phase is reached.

Accounting policy

Intangibles are carried at the acquisition cost, net of accumulated amortization and impairment charges.

The estimated useful lives are as follows:

	Useful life
Railways concessions	3 to 50 years
Usufruct	22 to 31 years
Software	5 years

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

19. Property, plant and equipment

Changes in property, plant and equipment are as follows:

	Land	Building	Facilities	Equipment	Mineral properties	Right of use assets	Others	Constructions in progress	Total
Balance at December 31, 2017 ...	718	12,100	11,786	6,893	9,069	-	8,193	6,119	54,878
Additions(i)	-	-	-	-	-	-	-	2,823	2,823
Disposals	(11)	(53)	(93)	(234)	(8)	-	(79)	(92)	(570)
Assets retirement obligation	-	-	-	-	446	-	-	-	446
Depreciation, amortization and depletion	-	(531)	(655)	(847)	(525)	-	(653)	-	(3,211)
Impairment (note 20)	-	(10)	(18)	(21)	-	-	(31)	(104)	(184)
Translation adjustment	(84)	(1,360)	(1,471)	(560)	(864)	-	(990)	(468)	(5,797)
Transfers	12	806	1,687	1,176	381	-	829	(4,891)	-
Balance at December 31, 2018 ...	635	10,952	11,236	6,407	8,499	-	7,269	3,387	48,385
Cost	635	18,267	17,611	12,424	16,717	-	11,697	3,387	80,738
Accumulated depreciation	-	(7,315)	(6,375)	(6,017)	(8,218)	-	(4,428)	-	(32,353)
Balance at December 31, 2018 ...	635	10,952	11,236	6,407	8,499	-	7,269	3,387	48,385
Effects of IFRS 16 adoption(ii)	-	-	-	-	-	1,801	-	-	1,801
Additions(i)	-	-	-	-	-	152	-	4,297	4,449
Disposals	(25)	(84)	(75)	(70)	(164)	(7)	(181)	(25)	(631)
Assets retirement obligation	-	-	-	-	429	-	-	-	429
Depreciation, amortization and depletion	-	(514)	(666)	(866)	(603)	(183)	(671)	-	(3,503)
Impairment (note 20)	-	(577)	(1,113)	(708)	(600)	(55)	(792)	(353)	(4,198)
Acquisition of subsidiary(iii)	62	15	41	46	276	2	-	46	488
Translation adjustment	24	(221)	(275)	(102)	88	(18)	(156)	16	(644)
Transfers	19	416	456	979	336	-	784	(2,990)	-
Balance at December 31, 2019 ...	715	9,987	9,604	5,686	8,261	1,692	6,253	4,378	46,576
Cost	715	18,255	17,170	11,756	17,826	1,875	11,521	4,378	83,496
Accumulated depreciation	-	(8,268)	(7,566)	(6,070)	(9,565)	(183)	(5,268)	-	(36,920)
Balance at December 31, 2019 ...	715	9,987	9,604	5,686	8,261	1,692	6,253	4,378	46,576

(i) Includes capitalized borrowing costs.

(ii) Refers to the recognition of right-of-use assets related to lease agreements in accordance with IFRS 16. Changes in leases by asset class are disclosed in note 2(c).

(iii) Refers mainly to the acquisition of Ferrous Resources Limited (note 14).

Accounting policy

Property, plant and equipment are recorded at the cost of acquisition or construction, net of accumulated depreciation and impairment charges.

Mineral properties developed internally are determined by (i) direct and indirect costs attributed to build the mining facilities, (ii) financial charges incurred during the construction period, (iii) depreciation of other fixed assets used during construction, (iv) estimated decommissioning and site restoration expenses, and (v) other capitalized expenditures during the development phase (phase when the project

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

19. Property, plant and equipment (Continued)

demonstrates its economic benefit to the Company, and the Company has ability and intention to complete the project).

The depletion of mineral properties is determined based on the ratio between production and total proven and probable mineral reserves.

Property, plant and equipment, other than mineral properties are depreciated using the straight-line method based on the estimated useful lives, from the date on which the assets become available for their intended use and are capitalized, except for land which is not depreciated.

The estimated useful lives are as follows:

	<u>Useful life</u>
Buildings	3 to 50 years
Facilities	3 to 50 years
Equipment	3 to 40 years
Others:	
Locomotives	12 to 25 years
Wagon	30 to 44 years
Railway equipment	5 to 33 years
Ships	20 years
Others	2 to 50 years

The residual values and useful lives of assets are reviewed at the end of each reporting period and adjusted if necessary.

Expenditures and stripping costs

(i) Exploration and evaluation expenditures—Expenditures on mining research are accounted for as operating expenses until the effective proof of economic feasibility and commercial viability of a given field can be demonstrated. From then on, the expenditures incurred are capitalized as mineral properties.

(ii) Expenditures on feasibility studies, new technologies and others research—The Company also conducts feasibility studies for many businesses which it operates including researching new technologies to optimize the mining process. After these costs are proven to generate future benefits to the Company, the expenditures incurred are capitalized.

(iii) Maintenance costs—Significant industrial maintenance costs, including spare parts, assembly services, and others, are recorded in property, plant and equipment and depreciated through the next programmed maintenance overhaul.

(iv) Stripping Costs—The cost associated with the removal of overburden and other waste materials (“stripping costs”) incurred during the development of mines, before production takes place, are capitalized as part of the depreciable cost of the mineral properties. These costs are subsequently amortized over the useful life of the mine.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

19. Property, plant and equipment (Continued)

Post-production stripping costs are included in the cost of inventory, except when a new project is developed to permit access to a significant ore deposits. In such cases, the cost is capitalized as a non-current asset and is amortized during the extraction of the ore deposits, over the useful life of the ore deposits.

Leases—At inception of a contract, the Company assesses whether a contract is, or contains, a lease. A contract is, or contains a lease, if the contract conveys the right to control the use of an identified asset for a period of time in exchange for consideration.

The Company recognizes a right-of-use asset and a lease liability at the lease commencement date. The right-of-use asset is initially measured at cost, which comprises the initial amount of the lease liability adjusted for any lease payments made at or before the commencement date. The right-of-use asset is subsequently depreciated using the straight-line method from the commencement date to the earlier of the end of the lease term or the end of the useful life of the right-of-use asset.

The lease liability is initially measured at the present value of the lease payments, discounted using the interest rate implicit in the lease or, if that rate cannot be readily determined, the Company's incremental borrowing rate. Lease payments included in the measurement of the lease liability comprise: (i) fixed payments, including in-substance fixed payments; (ii) variable lease payments that depend on an index or a rate; and (iii) the exercise price under a purchase option or renewal option that are under the Company's control and is reasonably certain to be exercised.

The lease liability is measured at amortized cost using the effective interest method. It is remeasured when there is a change in future lease payments arising from a change in an index or rate. When the lease liability is remeasured, a corresponding adjustment is made to the carrying amount of the right-of-use asset or is recorded in profit or loss if the carrying amount of the right-of-use asset has been reduced to zero.

Critical accounting estimates and judgments

Mineral reserves—The estimates of proven and probable reserves are regularly evaluated and updated. These reserves are determined using generally accepted geological estimates. The calculation of reserves requires the Company to make assumptions about expected future conditions that are uncertain, including future ore prices, exchange rates, inflation rates, mining technology, availability of permits and production costs. Changes in assumptions could have a significant impact on the proven and probable reserves of the Company.

The estimated volume of mineral reserves is used as basis for the calculation of depletion of the mineral properties, and also for the estimated useful life which is a major factor to quantify the provision for asset retirement obligation, environmental recovery of mines and impairment of long lived asset. Any changes to the estimates of the volume of mine reserves and the useful lives of assets may have a significant impact on the depreciation, depletion and amortization charges and assessments of impairment.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

20. Impairment and onerous contracts

The impairment losses recognized in the year are presented below:

Segments by class of assets	Income statement		
	Impairment		
	2019	2018	2017
Property, plant and equipment and intangibles			
Base metals—nickel	2,511	–	133
Coal	1,691	–	–
Other assets.....	119	184	138
Impairment of non-current assets.....	4,321	184	271
Onerous contracts	240	393	–
Disposals of non-current assets	513	322	23
Impairment and disposals of non-current assets.....	5,074	899	294

a) Impairment of non-financial assets

The Company has carried out an impairment test for the assets that a triggering event was identified and for goodwill. The recoverable amount of each Cash Generating Unit (“CGU”) under the impairment testing was assessed using fair value less costs of disposal model (“FVLCD”), through discounted cash flow techniques, which is classified as “level 3” in the fair value hierarchy.

The cash flows were discounted using a post-tax discount rate, which represents an estimate of the rate that a market participant would apply having regard to the time value of money and the risks specific to the asset. The Company used its weighted average cost of capital (“WACC”) as a starting point for determining the discount rates, with appropriate adjustments for the risk profile of the countries in which the individual CGU operate.

Iron ore and Pellets—During 2019, the Company did not identify any changes in the circumstances or indicators that would indicate an impairment trigger of the Iron ore and Pellets CGU. However, Management undertook an impairment testing for the goodwill and, based on the net present value of post-tax cash flows discounted at 6.3%, no impairment loss was identified as well. Of the total goodwill (note 18), US\$1,770 is allocated to the group of ferrous minerals.

Coal—In 2019, the Company identified that the expected yield of metallurgical coal and thermal coal will not be achieved, mostly due to technical issues on the project and operation of the assets related to this CGU. Management also conducted a detailed review of the mining plan, leading to a significant reduction on the proven and probable reserves. In addition, Management has lowered its long-term price assumption for both metallurgical and thermal coal, based on the current market outlook for coal.

Therefore, the Company has carried out an impairment test for the coal CGU and the assets related to the coal business were impaired in full. As a result, the Company recognized an impairment charge of US\$1,691 as at December 31, 2019, based on the net present value of post-tax cash flows discounted at 9.2%.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

20. Impairment and onerous contracts (Continued)

Base metals, Nickel—The New Caledonian operation has experienced challenging issues throughout 2019, mainly in relation to production and processing. Thus, the Company has revised the business plan of this CGU, reducing the expected production levels of its refined nickel product for remaining useful life of the mine. The new business strategy for this CGU led to an impairment charge of US\$2,511 recorded as at December 31, 2019, based on the net present value of post-tax cash flows discounted at 5.2%. The CGU's carrying amount after the impairment charge is US\$404 as at December 31, 2019.

The individual assumptions subject to the most estimation uncertainty for the FVLCD calculation are the nickel price and the discount rate. To illustrate these sensitivities, the carrying value would be fully impaired by an increase to the discount rate of 5.6%, or a reduction of US\$1,150 per ton to the nickel long-term price, if all other inputs remained constant.

In 2017, an underground mine in Sudbury (Stobie) that was affected by seismic activities and the cost to repair the asset is deemed not recoverable in the current market conditions. Therefore, the Company has placed this asset on "care and maintenance" and an impairment of US\$133 was recognized in the income statement.

Of the total goodwill (note 18), US\$1,859 is allocated to the group of nickel CGUs. Although, an impairment loss was recognized in relation to the New Caledonia CGU, the impairment testing over the goodwill demonstrates that there would be no impairment loss in relation to that goodwill allocated to the nickel business, based on the net present value of post-tax cash flows discounted using rates ranging from 5% to 6%.

Other assets—The Company has undertaken a review on the business plan of its biological assets leading to a reduction in the expected operational capacity of these assets. Management has also reviewed its long-term price assumption based on the current market condition. Thus, the Company carried out an impairment test and an impairment loss of US\$119 (2018: US\$184) was recognized in the income statement.

b) Onerous contract

In 2019, the Company reviewed its expectation of iron ore production and sales volumes of the Midwest system. Following the revised plan for the upcoming years, the Company has recognized an additional provision of US\$240 (2018: US\$393) in relation to the costs of certain long-term contracts, with minimum guaranteed volume for fluvial transportation and port structure.

c) Disposals of assets

Refers to non-viable projects and operating assets written off through sale or obsolescence. Additionally, includes assets write-off of the Córrego do Feijão mine and those related to the other upstream dams in Brazil, as described in note 3e.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

20. Impairment and onerous contracts (Continued)

Accounting policy

Impairment of non-financial assets—Non-financial assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount might not be recoverable. An impairment loss is recognized for the amount by which the asset's carrying value exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs of disposal ("FVLCD") and value in use ("VIU").

FVLCD is generally determined as the present value of the estimated future cash flows expected to arise from the continued use of the asset from a market participant's perspective, including any expansion prospects. VIU model is determined as the present value of the estimated future cash flows expected to arise from the continued use of the asset in its present form. Value in use is determined by applying assumptions specific to the Company's continued use and cannot take into account future development. These assumptions are different to those used in calculating fair value and consequently the VIU calculation is likely to give a different result to a FVLCD calculation.

Assets that have an indefinite useful life and are not subject to amortization, such as goodwill, are tested annually for impairment.

For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (CGU). Goodwill is allocated to Cash Generating Units or Cash Generating Units groups that are expected to benefit from the business combinations in which the goodwill arose and are identified in accordance with the operating segment.

Non-current assets (excluding goodwill) in which the Company recognized impairment in the past are reviewed whenever events or changes in circumstances indicate that the impairment may no longer be applicable. In such cases, an impairment reversal will be recognized.

Onerous Contracts—For certain long-term contracts, a provision is recognized when the present value of the unavoidable cost to meet the Company's obligation exceeds the economic benefits that could be received from those contracts.

Critical accounting estimates and judgments

Significant judgements, estimates and assumptions are required to determine whether an impairment trigger has occurred and to prepare the Company's cash flows. Management uses the budgets approved as a starting point and key assumptions are, but not limited to: (i) mineral reserves and mineral resources measured by internal experts; (ii) costs and investments based on the best estimate of projects as supported by past performance; (iii) sale prices consistent with projections available in reports published by industry considering the market price when appropriate; (iv) the useful life of each cash-generating unit (ratio between production and mineral reserves); and (v) discount rates that reflect specific risks relating to the relevant assets in each cash-generating unit.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

20. Impairment and onerous contracts (Continued)

These assumptions are susceptible to risks and uncertainties and may change the Company's projection and, therefore, may affect the recoverable value of assets.

21. Loans, borrowings, cash and cash equivalents and short-term investments

a) Net debt

The Company evaluates the net debt with the objective of ensuring the continuity of its business in the long term.

	December 31, 2019	December 31, 2018
Debt contracts in the international markets	10,494	11,783
Debt contracts in Brazil	2,562	3,683
Total of loans and borrowings	13,056	15,466
(-) Cash and cash equivalents.....	7,350	5,784
(-) Short-term investments.....	826	32
Net debt.....	4,880	9,650

b) Cash and cash equivalents

Cash and cash equivalents includes cash, immediately redeemable deposits and short-term investments with an insignificant risk of change in value. They are readily convertible to cash, part in R\$, indexed to the Brazilian Interbank Interest rate ("DI Rate" or "CDI") and part denominated in US\$, mainly time deposits.

c) Short-term investments

At December 31, 2019, the balance of US\$826 is mainly comprised by investments in Financial Treasury Bills ("LFTs"), which are Brazilian government bonds, issued by the National Treasury. LFTs are floating-rate securities, liquid in the secondary markets and subject to a low risk of changes in value.

d) Loans and borrowings

As at December 31, 2019 and 2018, loans and borrowings are secured by property, plant and equipment in the amount of US\$220 and US\$221, respectively.

The securities issued through Vale's wholly-owned finance subsidiary Vale Overseas Limited are fully and unconditionally guaranteed by Vale.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

21. Loans, borrowings, cash and cash equivalents and short-term investments (Continued)

i) Total debt

	Current liabilities		Non-current liabilities	
	December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2018
Debt contracts in the international markets				
Floating rates in:				
US\$	113	141	2,802	1,832
EUR	-	-	225	229
Fixed rates in:				
US\$	147	14	6,080	8,368
EUR	-	-	843	859
Other currencies	14	25	106	127
Accrued charges	160	188	4	-
	<u>434</u>	<u>368</u>	<u>10,060</u>	<u>11,415</u>
Debt contracts in Brazil				
Floating rates in:				
R\$, indexed to TJLP, TR, IPCA, IGP-M and CDI ...	650	435	1,677	2,849
Basket of currencies and US\$ indexed to LIBOR .	44	101	56	100
Fixed rates in:				
R\$	43	57	45	91
Accrued charges	43	42	4	8
	<u>780</u>	<u>635</u>	<u>1,782</u>	<u>3,048</u>
Total	<u>1,214</u>	<u>1,003</u>	<u>11,842</u>	<u>14,463</u>

The future flows of debt payments, principal and interest, are as follows:

	Principal	Estimated future interest payments(i)
2020.....	1,012	702
2021.....	788	641
2022.....	1,026	608
2023.....	1,192	568
Between 2024 and 2028.....	4,483	2,035
2029 onwards	4,344	2,706
Total	<u>12,845</u>	<u>7,260</u>

(i) Based on interest rate curves and foreign exchange rates applicable as at December 31, 2019 and considering that the payments of principal will be made on their contracted payments dates. The amount includes the estimated interest not yet accrued and the interest already recognized in the financial statements.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

21. Loans, borrowings, cash and cash equivalents and short-term investments (Continued)

At December 31, 2019, the average annual interest rates by currency are as follows:

	Average interest rate(i)	Total debt
Loans and borrowings		
US\$	5.57%	9,370
R\$(ii)	9.38%	2,461
EUR(iii)	3.77%	1,103
Other currencies	3.58%	122
		13,056

- (i) In order to determine the average interest rate for debt contracts with floating rates, the Company used the rate applicable at December 31, 2019.
- (ii) R\$ denominated debt that bears interest at IPCA, CDI, TR or TJLP, plus spread. For a total of US\$2,435 the Company entered into derivative transactions to mitigate the exposure to the cash flow variations of the floating rate debt denominated in R\$, resulting in an average cost of 3.09% per year in US\$.
- (iii) Eurobonds, for which the Company entered into derivatives to mitigate the exposure to the cash flow variations of the debt denominated in EUR, resulting in an average cost of 4.29% per year in US\$.

ii) Reconciliation of debt to cash flows arising from financing activities

	Loans and borrowings
December 31, 2018	15,466
Additions	3,142
Repayments(i)	(5,417)
Interest paid	(921)
Cash flow from financing activities	(3,196)
Effect of exchange rate	(158)
Interest accretion	944
Non-cash changes	786
December 31, 2019	13,056

- (i) The Company conducted a repurchase of certain guaranteed notes issued by Vale a total of US\$2,270. Additionally, the Company paid of US\$265 as expenses with cash tender offer repurchased.

iii) Credit and financing lines

The revolving credit facilities available today were provided by a syndicate of several global commercial banks. To mitigate liquidity risk, Vale has two revolving credit facilities, which will mature in 2022 and 2024, in the available amount of US\$5,000 to assist the short term liquidity management and to enable more efficiency in cash management, being consistent with the strategic focus on cost of capital reduction. As of December 31, 2019 these lines are undrawn.

On March 24, 2020 (subsequent event), the Company drew down its revolving credit facilities in full. Please see further disclosures on note 34.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

21. Loans, borrowings, cash and cash equivalents and short-term investments (Continued)

Accounting policy

Loans and borrowings are initially measured at fair value, net of transaction costs incurred and are subsequently carried at amortized cost and updated using the effective interest rate method. Any difference between the proceeds (net of transaction costs) and the redemption value is recognized in the Income statement over the period of the loan, using the effective interest rate method. The fees paid in obtaining the loan are recognized as transaction costs.

Loans and borrowing costs are capitalized as part of property, plants and equipment if those costs are directly related to a qualified asset. The capitalization occurs until the qualified asset is ready for its intended use. The average capitalization rate is 14%. Borrowing costs that are not capitalized are recognized in the income statement in the period in which they are incurred.

Some of the Company's debt agreements with lenders contain financial covenants. The primary financial covenants in those agreements require maintaining certain ratios, such as debt to EBITDA and interest coverage. The Company has not identified any instances of noncompliance as at December 31, 2019 and 2018.

22. Liabilities related to associates and joint ventures

On November 5, 2015, a rupture has occurred in the Fundão tailings dam, in Mariana (State of Minas Gerais), operated by Samarco Mineração S.A. ("Samarco"), a joint venture controlled by Vale S.A. and BHP Billiton Brasil Ltda. ("BHP"). In March 2016, Samarco and its shareholders entered into a Framework Agreement with governmental authorities, in which Samarco, Vale S.A. and BHP agreed to establish the Fundação Renova, an entity responsible to develop and implement 42 long-term mitigation and compensation programs.

In addition to the Fundão tailings dam, Samarco owns the Germano dam, which was also built under the upstream method and has been inactive since the Fundão dam rupture.

On October 25, 2019, Samarco obtained the Corrective Operation License for its operating activities in the Germano Complex. Following this authorization, Samarco has obtained all environmental licenses required to restart its operations. Samarco currently expects to restart its operations by the end of 2020.

Fundação Renova

During 2019, Fundação Renova reviewed the estimates of the costs required to mitigate and compensate the impacts from the rupture of Fundão dam. As a result, Vale recognized an additional provision of US\$501 (R\$1,963 million), which is the present value of the revised estimate in relation to Vale's responsibility to support Fundação Renova and is equivalent to 50% of Samarco's additional obligations over the next 11 years.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

22. Liabilities related to associates and joint ventures (Continued)

Overall, the programs rely on future actions, which indicates a broad range of possible estimates. Estimates of mitigation and compensation actions may vary according to the progress of the ongoing programs developed by the Fundação Renova and changes in scope. The amounts disclosed in these interim financial statements have been determined based on Management's best estimates and consider the facts and circumstances known to date.

The contingencies related to the Fundão dam rupture are disclosed in note 28.

Germano dam

Due to the new safety requirements set by ANM, Samarco prepared a project for the de-characterization of this dam. During May 2019, the concept of a project for the de-characterization of the Germano dam was filed. The conceptual project was concluded in August 2019 and is subject to further review and eventual approval by the competent authorities. Accordingly, based on the information available on the preparation of these financial statements, the estimated amount based on the expected cash outflows resulted in an additional provision of US\$257 (R\$993 million) recognized during 2019.

The changes in the provision to meet the obligations under the agreement related to the Fundão dam rupture and to the de-characterization of Germano dam in the year ended December 31, 2019 and 2018 are as follows:

	<u>2019</u>	<u>2018</u>
Balance at January 1	1,121	996
Payments	(315)	(290)
Interest accretion	200	165
Provision increase	758	403
Translation adjustment	(64)	(153)
Balance at December 31	1,700	1,121
Current liabilities	516	289
Non-current liabilities	1,184	832
Liabilities	1,700	1,121

Samarco's working capital

In addition to the provision, Vale S.A. made available in the year ended December 31, 2019 and 2018 the amount of US\$102 and US\$84, respectively, which was fully used to fund Samarco's working capital. This amount was recognized in Vale's income statement as an expense in "Equity results and other results in associates and joint ventures".

During 2020, Vale S.A. may provide a short-term credit facility up to US\$267 to support the Samarco's cash needs, without any binding obligation to Samarco. The availability of funds by the shareholders—Vale S.A. and BHP—is subject to the fulfillment of certain conditions, being deliberated by the shareholders, in the same bases and concomitantly, if required.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

22. Liabilities related to associates and joint ventures (Continued)

Under Brazilian legislation and the terms of the joint venture agreement, Vale does not have an obligation to provide funding to Samarco. Accordingly, Vale's investment in Samarco was fully impaired and no provision was recognized in relation to the Samarco's negative equity.

The summarized financial information of Samarco are as follows. The stand-alone financial statements of these entity may differ from the financial information reported herein, which is prepared considering Vale's accounting policies.

	December 31, 2019	December 31, 2018
Current assets	34	54
Non-current assets	3,940	5,877
Total assets	3,974	5,931
Current liabilities	6,990	6,066
Non-current liabilities	5,527	4,283
Total liabilities	12,517	10,349
Negative reserves	(8,543)	(4,418)
Loss for the year ended	(4,125)	(640)

Insurance

Since the Fundão dam rupture, the Company has been negotiating with insurers the indemnification payments based on its general liability policies. During the 2019, the Company received payments in the amount of US\$109 and recognized a gain in the income statement as "Equity results and other results in associates and joint ventures".

Critical accounting estimates and judgments

The provision related to Fundação Renova requires the use of assumptions that may be mainly affected by: (i) changes in scope of work required under the Framework Agreement as a result of further technical analysis and the ongoing negotiations with the Federal Prosecution Office, (ii) resolution of uncertainty in respect of the resumption of Samarco's operations; (iii) updates of the discount rate; and (iv) resolution of existing and potential legal claims.

Moreover, the main critical assumptions and estimates applied in the Germano dam provision considers, among others: (i) volume of the waste to be removed based on historical data available and interpretation of the enacted laws and regulations; (ii) location availability for the tailings disposal; and (iii) acceptance by the authorities of the proposed engineering methods and solution.

As a result, future expenditures may differ from the amounts currently provided and changes to key assumptions could result in a material impact to the amount of the provision in future reporting periods. At each reporting period, the Company reassess the key assumptions used by Samarco in the preparation of the projected cash flows and adjust the provision, if required.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

23. Financial instruments classification

The Company classifies its financial instruments in accordance with the purpose for which they were acquired, and determines the classification and initial recognition according to the following categories:

	December 31, 2019				December 31, 2018			
	Amortized cost	At fair value through OCI	At fair value through profit or loss	Total	Amortized cost	At fair value through OCI	At fair value through profit or loss	Total
Financial assets								
Current								
Cash and cash equivalents	7,350	-	-	7,350	5,784	-	-	5,784
Short-term investments	-	-	826	826	-	-	32	32
Derivative financial instruments	-	-	288	288	-	-	39	39
Accounts receivable	2,452	-	77	2,529	2,756	-	(108)	2,648
Related parties	319	-	-	319	364	-	-	364
	10,121	-	1,191	11,312	8,904	-	(37)	8,867
Non-current								
Judicial deposits	3,159	-	-	3,159	1,716	-	-	1,716
Bank accounts restricted	125	-	-	125	-	-	-	-
Derivative financial instruments	-	-	184	184	-	-	392	392
Investments in equity securities	-	726	-	726	-	987	-	987
Loans	87	-	-	87	153	-	-	153
Related parties	1,600	-	-	1,600	1,612	-	-	1,612
	4,971	726	184	5,881	3,481	987	392	4,860
Total of financial assets	15,092	726	1,375	17,193	12,385	987	355	13,727

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

23. Financial instruments classification (Continued)

	December 31, 2019				December 31, 2018			
	Amortized cost	At fair value through OCI	At fair value through profit or loss	Total	Amortized cost	At fair value through OCI	At fair value through profit or loss	Total
Financial liabilities								
Current								
Suppliers and contractors	4,107	-	-	4,107	3,512	-	-	3,512
Leases	225	-	-	225	-	-	-	-
Derivative financial instruments	-	-	94	94	-	-	470	470
Loans and borrowings .	1,214	-	-	1,214	1,003	-	-	1,003
Interest on capital	1,571	-	-	1,571	-	-	-	-
Related parties	980	-	-	980	1,134	-	-	1,134
	8,097	-	94	8,191	5,649	-	470	6,119
Non-current								
Leases	1,566	-	-	1,566	-	-	-	-
Derivative financial instruments	-	-	307	307	-	-	344	344
Loans and borrowings .	11,842	-	-	11,842	14,463	-	-	14,463
Related parties	956	-	-	956	960	-	-	960
Participative stockholders' debentures	-	-	2,584	2,584	-	-	1,407	1,407
Financial guarantees ...	-	-	525	525	-	-	166	166
	14,364	-	3,416	17,780	15,423	-	1,917	17,340
Total of financial liabilities	22,461	-	3,510	25,971	21,072	-	2,387	23,459

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

23. Financial instruments classification (Continued)

The classification of financial assets and liabilities by currencies are as follows:

	December 31, 2019					
	R\$	US\$	CAD	EUR	Other currencies	Total
Financial assets						
Current						
Cash and cash equivalents	2,822	4,361	41	11	115	7,350
Short-term investments	826	–	–	–	–	826
Derivative financial instruments	111	177	–	–	–	288
Accounts receivable	389	2,121	5	–	14	2,529
Related parties	–	319	–	–	–	319
	4,148	6,978	46	11	129	11,312
Non-current						
Judicial deposits	3,159	–	–	–	–	3,159
Bank accounts restricted	125	–	–	–	–	125
Derivative financial instruments	147	37	–	–	–	184
Investments in equity securities	–	726	–	–	–	726
Loans	4	83	–	–	–	87
Related parties	–	1,600	–	–	–	1,600
	3,435	2,446	–	–	–	5,881
Total of financial assets	7,583	9,424	46	11	129	17,193
Financial liabilities						
Current						
Suppliers and contractors	2,317	989	524	177	100	4,107
Leases	86	110	16	–	13	225
Derivative financial instruments	69	25	–	–	–	94
Loans and borrowings	734	429	16	35	–	1,214
Interest on capital	1,571	–	–	–	–	1,571
Related parties	569	411	–	–	–	980
	5,346	1,964	556	212	113	8,191
Non-current						
Leases	329	1,136	89	–	12	1,566
Derivative financial instruments	241	66	–	–	–	307
Loans and borrowings	1,727	8,941	106	1,068	–	11,842
Related parties	–	956	–	–	–	956
Participative stockholders' debentures	2,584	–	–	–	–	2,584
Financial guarantees	525	–	–	–	–	525
	5,406	11,099	195	1,068	12	17,780
Total of financial liabilities	10,752	13,063	751	1,280	125	25,971

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

23. Financial instruments classification (Continued)

	December 31, 2018					
	R\$	US\$	CAD	EUR	Other currencies	Total
Financial assets						
Current						
Cash and cash equivalents	2,765	2,883	23	12	101	5,784
Short-term investments	1	31	-	-	-	32
Derivative financial instruments	30	9	-	-	-	39
Accounts receivable	447	2,197	4	-	-	2,648
Related parties	-	364	-	-	-	364
	3,243	5,484	27	12	101	8,867
Non-current						
Judicial deposits	1,716	-	-	-	-	1,716
Derivative financial instruments	380	12	-	-	-	392
Investments in equity securities	-	987	-	-	-	987
Loans	5	148	-	-	-	153
Related parties	-	1,612	-	-	-	1,612
	2,101	2,759	-	-	-	4,860
Total of financial assets	5,344	8,243	27	12	101	13,727
Financial liabilities						
Current						
Suppliers and contractors	1,791	1,182	292	141	106	3,512
Derivative financial instruments	389	81	-	-	-	470
Loans and borrowings	532	410	25	36	-	1,003
Related parties	769	365	-	-	-	1,134
	3,481	2,038	317	177	106	6,119
Non-current						
Derivative financial instruments	321	23	-	-	-	344
Loans and borrowings	2,948	10,300	127	1,088	-	14,463
Related parties	65	895	-	-	-	960
Participative stockholders' debentures	1,407	-	-	-	-	1,407
Financial guarantees	166	-	-	-	-	166
	4,907	11,218	127	1,088	-	17,340
Total of financial liabilities	8,388	13,256	444	1,265	106	23,459

Accounting policy

The Company classifies financial instruments based on its business model for managing the assets and the contractual cash flow characteristics of those assets. The business model test determines the classification based on the business purpose for holding the asset and whether the contractual cash flows represent only payments of principal and interest.

Financial instruments are measured at fair value through profit or loss ("FVTPL") unless certain conditions are met that permit measurement at fair value through other comprehensive income ("FVOCI") or amortized cost. Gains and losses recorded in other comprehensive income for debt instruments are recognized in profit or loss only on disposal.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

23. Financial instruments classification (Continued)

Investments in equity instruments are measured at FVTPL unless they are eligible to be measured at FVOCI, whose gains and losses are never recycled to profit or loss.

Information about the Company's exposure to credit risk is set out in note 33.

All financial liabilities are initially measured at fair value, net of transaction costs incurred and are subsequently carried at amortized cost and updated using the effective interest rate method. Excepts for Participative stockholders' debentures and Derivative financial instruments that are measured at fair value through profit or loss.

24. Fair value estimate

Due to the short-term cycle, it is assumed that the fair value of cash and cash equivalents balances, financial investments, accounts receivable and accounts payable approximate their book values. For the measurement and determination of fair value, the Company uses various methods including market, income or cost approaches, in order to estimate the value that market participants would use when pricing the asset or liability. The financial assets and liabilities recorded at fair value are classified and disclosed in accordance with the following levels:

Level 1—Unadjusted quoted prices on an active, liquid and visible market for identical assets or liabilities that are accessible at the measurement date;

Level 2—Quoted prices (adjusted or unadjusted) for identical or similar assets or liabilities on active markets; and

Level 3—Assets and liabilities, for which quoted prices, do not exist, or where prices or valuation techniques are supported by little or no market activity, unobservable or illiquid.

a) Assets and liabilities measured and recognized at fair value:

	December 31, 2019				December 31, 2018			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Financial assets								
Short-term investments	826	–	–	826	32	–	–	32
Derivative financial instruments	–	448	24	472	–	136	295	431
Accounts receivable	–	77	–	77	–	(108)	–	(108)
Investments in equity securities	726	–	–	726	987	–	–	987
Total	1,552	525	24	2,101	1,019	28	295	1,342
Financial liabilities								
Derivative financial instruments	–	281	120	401	–	636	178	814
Participative stockholders' debentures	–	2,584	–	2,584	–	1,407	–	1,407
Financial guarantees	–	525	–	525	–	166	–	166
Total	–	3,390	120	3,510	–	2,209	178	2,387

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

24. Fair value estimate (Continued)

There were no transfers between Level 1 and Level 2, or between Level 2 and Level 3 for the year ended in December 31, 2019.

The following table presents the changes in Level 3 assets and liabilities for the year ended in December 31, 2019:

	Derivative financial instruments	
	Financial assets	Financial liabilities
Balance at December 31, 2018.....	295	178
Gain and losses recognized in income statement	36	(33)
Translation adjustments	(25)	(7)
Settlements	(282)	(18)
Balance at December 31, 2019.....	<u>24</u>	<u>120</u>

Methods and techniques of evaluation

i) Derivative financial instruments

Derivative financial instruments are evaluated through the use of market curves and prices impacting each instrument at the closing dates, detailed in the item “market curves” (note 35).

For the pricing of options, the Company often uses the Black & Scholes model. In this model, the fair value of the derivative is determined basically as a function of the volatility and the price of the underlying asset, the strike price of the option, the risk-free interest rate and the option maturity. In the case of options where payoff is a function of the average price of the underlying asset over a certain period during the life of the option, the Company uses Turnbull & Wakeman model. In this model, in addition to the factors that influence the option price in the Black-Scholes model, the formation period of the average price is also considered.

In the case of swaps, both the present value of the long and short positions are estimated by discounting their cash flows by the interest rate in the related currency. The fair value is determined by the difference between the present value of the long and short positions of the swap in the reference currency.

For the swaps indexed to TJLP, the calculation of the fair value assumes that TJLP is constant, that is, the projections of future cash flows in Brazilian Reais are made considering the last TJLP disclosed.

Forward and future contracts are priced using the future curves of their corresponding underlying assets. Typically, these curves are obtained on the stock exchanges where these assets are traded, such as the London Metals Exchange (“LME”), the Commodity Exchange (“COMEX”) or other providers of market prices. When there is no price for the desired maturity, Vale uses an interpolation between the available maturities.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

24. Fair value estimate (Continued)

The fair value of derivatives within level 3 is estimated using discounted cash flows and option model valuation techniques with unobservable inputs of discount rates, stock prices and commodities prices.

ii) **Participative stockholders’ debentures**—Consist of the debentures issued during the privatization process (note 13), for which fair values are measured based on the market approach. Reference prices are available on the secondary market.

Critical accounting estimates and judgments

The fair values of financial instruments that are not traded in active markets are determined using valuation techniques. Vale uses its own judgment to choose between the various methods. Assumptions are based on the market conditions, at the end of the year.

An analysis of the impact if actual results are different from management’s estimates is present on note 35 (sensitivity analysis).

b) Fair value of financial instruments not measured at fair value

The fair value estimate for level 1 is based on market approach considering the secondary market contracts. For loans allocated to level 2, the income approach is adopted and the fair value for both fixed-indexed rate debt and floating rate debt is determined on a discounted cash flow basis using LIBOR future values and Vale’s bonds curve.

The fair values and carrying amounts of loans and borrowings are as follows:

<u>Financial liabilities</u>	<u>Balance</u>	<u>Fair value</u>	<u>Level 1</u>	<u>Level 2</u>
December 31, 2019				
Debt principal	12,845	14,584	8,983	5,601
December 31, 2018				
Debt principal	15,228	16,262	10,686	5,576

Libor discontinuation

In July 2017, the UK Financial Conduct Authority (“FCA”), which regulates the London Interbank Offered Rate (“LIBOR”), announced the effective discontinuation of that rate from the end of 2021, as banks will no longer be required to contribute rate quotations. The Company is currently evaluating the potential impact of the eventual replacement of the LIBOR interest rate.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

25. Derivative financial instruments (Continued)

b) Effects of derivatives on the income statement, cash flow and other comprehensive income

	Gain (loss) recognized in the income statement		
	Year ended December 31		
	2019	2018	2017
Foreign exchange and interest rate risk			
CDI & TJLP vs. US\$ fixed and floating rate swap	(39)	(206)	152
IPCA swap	118	(23)	43
Eurobonds swap	(39)	(27)	36
Euro forward	-	-	46
Pre-dollar swap.....	2	(23)	36
	42	(279)	313
Commodities price risk			
Nickel	58	(25)	30
Bunker oil, Gasoil and Brent	42	6	(80)
	100	(19)	(50)
Options—MBR.....	8	62	135
Conversion options—VLI.....	35	-	61
Others	59	(30)	(5)
	102	32	191
Total	244	(266)	454
Financial settlement inflows (outflows)			
Year ended December 31			
	2019	2018	2017
Foreign exchange and interest rate risk			
CDI & TJLP vs. US\$ fixed and floating rate swap	(381)	(135)	(181)
IPCA swap	(28)	7	(20)
Eurobonds swap	(5)	(3)	(39)
Pre-dollar swap.....	8	10	(1)
	(406)	(121)	(241)
Commodities price risk			
Nickel	48	8	4
Bunker oil, Gasoil and Brent	2	49	(3)
	50	57	1
Others	21	(3)	-
Derivatives designated as cash flow hedge accounting			
Nickel(i)	11	-	-
Total	(324)	(67)	(240)

(i) Refers to the effect of the nickel cash flow hedge transaction recorded as operating revenue.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

25. Derivative financial instruments (Continued)

	Gain recognized in other comprehensive income		
	Year ended December 31		
	2019	2018	2017
Derivatives designated as cash flow hedge accounting			
Nickel	150	-	-
Total	150	-	-

The maturity dates of the derivative financial instruments are as follows:

	Last maturity dates
Currencies and interest rates	September 2029
Nickel	December 2021
Brent	December 2020
Gasoil	December 2020
VLI	December 2027
Others	December 2023

c) Hedge in foreign operations

In January 2017, the Company implemented hedge accounting for the foreign currency risk arising from Vale S.A.'s net investments in Vale International S.A. and Vale Holding BV. Under the hedge accounting program, the Company's debt denominated in U.S. dollars and Euros serves as a hedge instrument for these investments. With the program, the impact of exchange rate variations on debt denominated in U.S. dollars and Euros has been partially recorded in other comprehensive income in the "Cumulative translation adjustments". As at December 31, 2019, the carrying value of the debts designated as instrument hedge of these investments are US\$2,457 and EUR750.

	Loss recognized in the other comprehensive income		
	Year ended December 31		
	2019	2018	2017
Hedge in foreign operation, net of tax	(74)	(543)	(95)

Accounting policy

The Company uses financial instruments to hedge its exposure to certain market risks arising from operational, financing and investing activities. Derivatives are included within financial assets or liabilities at fair value through profit or loss unless they are designated as effective hedging instruments.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

25. Derivative financial instruments (Continued)

At the beginning of the hedge operations, the Company documents the type of hedge, the relation between the hedging instrument and hedged items, its risk management objective and strategy for undertaking hedge operations. The Company also documents, both at hedge inception and on an ongoing basis that the hedge is expected to continue to be highly effective. The Company has elected to adopt the new general hedge accounting model in IFRS 9 and designates certain derivatives as either:

Cash flow hedge—The effective portion of changes in the fair value of derivatives that are designated and qualify as cash flow hedges is recognized in equity within “Unrealized fair value gain (losses)”. The gain or loss relating to the ineffective portion is recognized immediately in the income statement. When a hedging instrument expires or is sold, or when a hedge no longer meets the criteria for hedge accounting, any cumulative gain or loss existing in equity at that time remains in equity and is recognized in profit or loss when the transaction is recognized in the income statement.

Net investment hedge—Hedges of net investments in foreign operations are accounted for similarly to cash flow hedges. Any gain or loss on the hedging instrument relating to the effective portion of the hedge is recognized in equity within “Cumulative translation adjustments”. The gain or loss relating to the ineffective portion is recognized immediately in the income statement. Gains and losses accumulated in equity are included in the statement of income when the foreign operation is partially or fully disposed of or sold.

Derivatives at fair value through profit or loss—Certain derivative instruments do not qualify for hedge accounting. Changes in the fair value of any of these derivative instruments are recognized immediately in the income statement.

26. Provisions

	Current liabilities		Non-current liabilities	
	December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2018
Payroll, related charges and other remunerations	790	1,046	–	–
Onerous contracts (note 20)	57	60	866	642
Environmental obligations	146	100	243	202
Asset retirement obligations (note 27) ...	158	85	3,802	3,030
Provisions for litigation (note 28)	–	–	1,462	1,357
Employee postretirement obligations (note 29)	79	72	2,120	1,864
Provisions	1,230	1,363	8,493	7,095

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

27. Asset retirement obligations

Provision is made for expected costs for the closure of the mines and deactivation of the related mining assets. Changes in the provision for asset retirement obligations and long-term interest rates (per annum, used to discount these obligations to present value and to update the provisions) are as follows:

	December 31, 2019	December 31, 2018
Balance at beginning of the year	3,115	3,168
Present value valuation	37	15
Settlements	(47)	(27)
Revisions on cash flows estimates(i)	812	229
Translation adjustment	43	(270)
Balance at end of the year	3,960	3,115
Current	158	85
Non-current	3,802	3,030
	3,960	3,115
Long-term interest rates (per annum)		
Brazil	3.36%	4.94%
Canada	0.40%	0.77%
Mozambique	5.20%	8.53%
Other regions	0.60%–4.78%	1.33%–5.73%

(i) In 2019, includes changes in discount rates and updating plans for mine closure, that also considers new legal requirements related to the decommissioning.

Accounting policy

When the provision is recognized, the corresponding cost is capitalized as part of property, plant and equipment and it is depreciated over the useful life of the related mining asset, resulting in an expense recognized in the income statement.

The long-term liability is discounted at presented value using a pre-tax rate that reflects current market assessments of the time value of money and the risks specific to the liability and the unwinds are recorded in the income statement and is reduced by payments for mine closure and decommissioning of mining assets. The accrued amounts of these obligations are not deducted from the potential costs covered by insurance or indemnities.

Critical accounting estimates and judgments

Judgment is required to determine key assumptions used on the asset retirement obligation measurement such as, interest rate, cost of closure, useful life of the mining asset considering the current conditions of closure and the projected date of depletion of each mine. Any changes in these assumptions may significant impact the recorded provision. Therefore, the estimated costs for closure of the mining assets is deemed to be a critical accounting estimate and annually reviewed.



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

28. Litigations

a) Provision for litigations

Vale is party to labor, civil, tax and other ongoing lawsuits, at administrative and court levels. Provisions for losses resulting from lawsuits are estimated and updated by the Company, based on analysis from the Company's legal consultants.

Changes in provision for litigations are as follows:

	Tax litigation(i)	Civil litigation	Labor litigation	Environmental litigation	Total of litigation provision
Balance at December 31, 2017	815	131	517	10	1,473
Additions and reversals, net	17	65	106	(3)	185
Payments	(7)	(23)	(114)	(2)	(146)
Additions—discontinued operations	26	1	11	–	38
Indexation and interest	–	17	16	(1)	32
Translation adjustment	(122)	(25)	(77)	(1)	(225)
Balance at December 31, 2018	729	166	459	3	1,357
Additions and reversals, net	10	168	106	7	291
Payments	(33)	(58)	(110)	–	(201)
Indexation and interest	9	42	18	1	70
Translation adjustment	(19)	(18)	(18)	–	(55)
Balance at December 31, 2019	696	300	455	11	1,462

(i) Includes amounts regarding to social security claims that were previously classified as labor claims.

b) Contingent liabilities

The Company has contingent liabilities where claims are debated in both administrative and judicial claims and whose expected loss is classified as possible, and for which the recognition of a provision is not considered necessary by the Company.

Based in the legal opinions, the presentation of the litigations classified with expected loss as possible are presented as follow:

	December 31, 2019	December 31, 2018
Tax litigations(i)	8,395	8,853
Civil litigations	1,518	1,957
Labor litigations	773	1,263
Environmental litigations	1,094	1,051
Brumadinho event (note 3)	158	–
Total	11,938	13,124

(i) Includes amounts regarding to social security claims that were previously classified as labor claims.



Notes to the Financial Statements (Continued)
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28. Litigations (Continued)

i—Tax litigations—The most relevant contingent tax liabilities are associated with proceedings related to the (i) collection of IRPJ and CSLL, (ii) challenges of PIS and COFINS tax credits, (iii) assessments related to mining royalties (CFEM), and (iv) collection of ICMS, in particular related to credits claimed in connection with the sale and transmission of electricity; collection of ICMS in connection with goods that enter into the State of Pará and collection of ICMS and penalties over the transportation of iron ore by Vale itself.

Of the total amount of tax litigations, US\$1,106 relates to income taxes contingencies, which have been assessed by Management to determine whether the tax treatment related to the contingency is probable of being accepted by the tax authority. Further details on the assessment performed by the Company relation to uncertain tax positions is disclosed in note 8.

ii—Civil litigations—Most of those claims have been filed by suppliers for indemnification under construction contracts, primarily relating to certain alleged damages, payments and contractual penalties. A number of other claims related to contractual disputes regarding inflation index.

iii—Labor litigations—Represents individual claims by employees and service providers, primarily involving demands for additional compensation for overtime work, time spent commuting or health and safety conditions.

iv—Environmental litigations—The most significant claims concern alleged procedural deficiencies in licensing processes, non-compliance with existing environmental licenses or damage to the environment.

c) Judicial deposits

In addition to the provisions and contingent liabilities, the Company is required, by law, to make judicial deposits to secure a potential adverse outcome of certain lawsuits. These court-ordered deposits are monetarily adjusted and reported as non-current assets until a judicial decision to draw the deposit occurs.

	December 31, 2019	December 31, 2018
Tax litigations(i)	1,278	1,314
Civil litigations	112	60
Labor litigations	246	310
Environmental litigations	41	32
Brumadinho event (note 3)	1,482	-
Total	3,159	1,716

(i) Includes amounts regarding to judicial deposits of a social security claims that were previously classified as labor claims.

In addition to the above-mentioned tax, civil, labor and environmental judicial deposits, the Company contracted US\$2.6 billion (R\$10.4 billion) in guarantees for its lawsuits, as an alternative to judicial deposits. For the Brumadinho event, the Company contracted guarantees in the amount of US\$1.4 billion

Notes to the Financial Statements (Continued)
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28. Litigations (Continued)

(R\$5.6 billion) which were presented in court according agreement with Treasury Court of Minas Gerais and Public Prosecutor's Office.

d) Contingencies related to Samarco accident

(i) Public civil claim filed by the Federal Government and others and Public civil claim filed by Federal Prosecution Office ("MPF")

In 2016, the federal government, the Brazilian states of Espírito Santo and Minas Gerais and other governmental authorities have initiated a public civil lawsuit against Samarco and its shareholders, with an estimated value indicated by the plaintiffs of US\$5.3 billion (R\$20.2 billion). In the same year, MPF filed a public civil action against Samarco and its shareholders and presented several claims, including: (i) the adoption of measures for mitigating the social, economic and environmental impacts resulting from the dam failure and other emergency measures; (ii) the payment of compensation to the community; and (iii) payments for the collective moral damage. The action value indicated by MPF is US\$40.5 billion (R\$155 billion).

In June 2018, the parties entered into an agreement ("Term of Adjustment of Conduct"), which extinguishes (i) the public civil claim of US\$5.3 billion (R\$20.2 billion) filed by the Federal Government and others; and (ii) part of the claims included in the public civil claim of US\$40.5 billion (R\$155 billion) filed by MPF. The agreement also establishes a possible renegotiation of Fundação Renova's repair programs after the conclusion of the specialist's studies hired to advise the Public Prosecutor's Office in this process. These negotiations are expected to occur during 2020.

In September 2019, the Court approved the list of entities selected by the community to provide it with technical assistance to assure its participation on the debates regarding the measures to be adopted for mitigate the impacts, accordingly to the referred agreement.

In January 2020, the Court issued an order for the Brazilian Mining Authority (ANM) ratifying the revocation of the decision issued on the public civil actions filed by the Brazilian Federal Government and others, determine the immediate revocation of the restrictions on Vale's mining concessions.

(ii) United States class action lawsuits

In March 2017, holders of bonds issued by Samarco Mineração S.A., filed a class action suit in the Federal Court in New York against Samarco Mineração S.A., Vale S.A., BHP Billiton Limited, BHP Billiton PLC and BHP Brasil Ltda. under U.S. federal securities laws. The plaintiffs allege that Vale S.A. made false and misleading statements or not made disclosures concerning the risks and dangers of the operations of Samarco's Fundão dam and the adequacy of related programs and procedures.

In June 2019, the Court issued a decision and order dismissing with prejudice the putative federal securities class action. In December 2019 the plaintiffs filed a Notice of Appeal to the Court of Appeals, plaintiff's legal deadline to file the brief of the appeal should expire in March 2020. Based on the

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

28. Litigations (Continued)

assessment of the Company's legal consultants, the defendants would have better arguments to oppose the appeal to be filed by plaintiffs.

(iii) Class action lawsuits related to Vale's American Depositary Receipts

With respect to litigation in the United States concerning Samarco's Fundão dam, Vale and certain of our officers have been named as defendants in securities class action suits in the Federal Court in New York brought by holders of Vale's American Depositary Receipts under U.S. federal securities laws. The suit was brought as a putative class action on behalf of holders of Vale's American Depositary Receipts ("ADRs"), alleging violations of the U.S. Federal Securities laws on the basis of alleged false and misleading statements or omissions concerning the risks of operations of Samarco's Fundão dam and the adequacy of the related programs and procedures.

On March 23, 2017 the judge issued a decision rejecting a significant portion of the claims against Vale S.A. and the individual defendants, determining the prosecution of the action with respect to more limited claims. The portion of plaintiffs' case that remains is related to certain statements about procedures, policies and risk mitigation plans contained in Vale S.A.'s sustainability reports in 2013 and 2014, and certain statements regarding to the responsibility of Vale S.A. for the Fundão dam failure made in a conference call in November 2015.

Fact and Expert discovery was totally concluded in October 2019. On September 27, 2019, the Court denied class certification. On December 26, 2019, the Court issued an Order stating that the parties had informed the Court that the parties had reached a settlement in principle. The Court directed the parties to submit a motion to approve a proposed settlement no later than February 07, 2020. On February 07, 2020, the parties have filed to the Court an "Stipulation and Agreement of Settlement" by means of the defendants agreed to pay US\$25 to settle the case, which is yet subject to some Court approvals and other conditions to be fulfilled before the settlement can be considered as final and binding. These approvals and conditions are expected to occur in 2020.

(iv) Criminal lawsuit

In 2016, the MPF brought a criminal lawsuit against Samarco and its shareholders, VogBr Recursos Hídricos e Geotecnia Ltda. and 22 individuals for the consequences related to Fundão dam failure. Currently, the progress of the criminal action is paralyzed due to the judgment of Habeas Corpus, with no decision.

On April 23, 2019, the Federal Court from the 1st Region ("TRF1") issued an Habeas Corpus writ and granted it to dismiss the criminal charges of homicide and physical injuries committed by oblique intent held against one of the defendants on the criminal action. At the same opportunity, the Court extended the writ's issuance to all other defendants on the case as the criminal information does not describe the crimes of homicide and physical injury, but the crime of flooding qualified by the result of death and physical injury as a consequence of the Fundão dam's failure. Therefore, the Court dismissed the homicide and physical injuries charges held against all defendants.

Notes to the Financial Statements (Continued)
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28. Litigations (Continued)

After acknowledging the Court's decisions, the Ponte Nova Court changed the process, withdrawing the case from the grand jury and putting it in the ordinary processing. In the same opportunity, the judge ruled to determine the parties to manifest themselves about this process alteration and, after the Federal Prosecution and the defenses presented their petitions, the judge withdrew the charges against Vale and BHP executives and the accusation withheld for trial for the two companies together with Samarco and its representatives. The accusation of crimes committed against the Environmental Public Administration by Vale and one of its executives also remained unaltered. Additionally, the judge determined precatory letters to be sent to collect the defense witnesses testimonies and opened a 60 day term for the defenses to present a list of questions to be put together with the international cooperation for the testimony of the accusation witnesses residing in Canada.

(v) Tax proceedings

In 2018, the Office of the Attorney General for the National Treasury (PGFN) requested a judicial order to secure the payment of alleged federal tax and social security debts regarding Samarco. In May 2019, a favorable decision was issued dismissing the claim without prejudice, due to lack of procedural interest. The PGFN filed an appeal to the Local Court. The Company is waiting for the Court ruling.

e) Contingent Assets

(i) Compulsory loan

In 2015, the Company requested for the enforcement of the judicial decision in the amount of US\$130 (R\$524 million) related to a favorable unappealable decision which partially recognized its right to refund the differences of monetary adjustments and interests due over to the third convertible bonds issued by Eletrobrás shares in the period within 1987 to 1993. In November 2019, the Company requested for the payment of the amount of US\$74 (R\$297 million) recognized by Eletrobrás as due and awaits judicial analysis of the surplus amount. Therefore, it has not possible yet to determine the amount to be refunded and, consequently, the asset has not been registered in the Company's financial statements.

(ii) ICMS included in PIS and COFINS tax base

Vale had been discussing the issue regarding the exclusion of ICMS in PIS and COFINS tax basis in two judicial proceedings, related to taxable events after December 2001. In one of the proceedings, the company has obtained a definitive favorable decision (res judicata). In the second proceeding the current decision is also favorable to the Company, but this proceeding did not reach the res judicata. Vale is waiting for a final decision on the leading that will be issued by Supreme Court in order to calculate the amount to be refunded arising from both proceedings. The Company did not record this asset in its financial statement.

Notes to the Financial Statements (Continued)
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28. Litigations (Continued)

(iii) Arbitral award related to Simandou

In 2010, Vale acquired a 51% stake in VBG—Vale BSGR Limited (“VBG”) (formerly BSG Resources (Guinea) Limited), which had iron ore concession rights in Simandou South (“Zogota”) and iron ore exploration permits over the areas known as Simandou Blocks 1 & 2 in Guinea. In 2014, the Republic of Guinea revoked those rights after a finding that BSGR had obtained them through bribery of Guinean government officials. The Republic of Guinea did not make any finding of any involvement or responsibility on Vale’s part.

Vale commenced arbitration proceedings against BSG Resources Limited (“BSGR”) in April 2014, and in April 2019, the arbitral tribunal in London ruled in Vale’s favor and ordered BSGR to pay to Vale the amount of US\$1.2 billion plus costs and interest (with interest and costs, the award exceeds US\$2.0 billion). The arbitral tribunal ruled that BSGR had defrauded Vale by inducing Vale to enter into the joint venture. On September 20, 2019, the English High Court ruled that Vale can proceed with enforcement of its US\$2.0 billion arbitration award.

BSGR went into administration in March 2018, and Vale has commenced legal proceedings against BSGR before courts in London, England and in the United States District Court for the Southern District of New York to enforce the arbitral award against BSGR.

BSGR challenged the award before the English High Court, and its challenge was dismissed on November 29, 2019. BSGR has also applied to the United States Bankruptcy Court to have its administration recognized in the United States.

On December 3, 2019, Vale and two of its affiliates filed new litigation proceedings in the English High Court, claiming damages of approximately US\$1.85 billion, against certain individuals and related parties to BSGR.

Vale intends to pursue the enforcement of the award and collection of the amounts due by all legally available means, but since there can be no assurance as to the timing and amount of any collections, the asset was not recognized in its financial statements.

(iv) Canadian Tax Litigation Matter

Vale Canada Limited (“VCL”) and the Canadian Department of Justice—Canada Revenue Agency signed an agreement regarding a tax litigation matter related to the appropriate tax treatment of certain receipts received and expenditures incurred by VCL in respect of merger and acquisition transactions in 2006. In 2019, the Company recognized a contingent asset in amount of US\$170 (CAD 221 million), related an income tax refund, included estimated interest. On January 28, 2020 (subsequent event), the Company received a portion of this asset in the amount of US\$145 (CAD 189 million).

Notes to the Financial Statements (Continued)
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28. Litigations (Continued)

Accounting policy

A provision is recognized when it is considered probable that an outflow of resources will be required to settle the obligation and can be reliably estimated. The liability is accounted against an expense in the income statement. This obligation is updated based on the developments of the judicial process or interest accretion and can be reversed if the expectation of loss is not considered probable due to changes in circumstances or when the obligation is settled.

Critical accounting estimates and judgments

Litigations are contingent by nature, that is, it will be resolved when one or more future event occurs or fails to occur. Typically, the occurrence or not of such events is outside of the Company's control. Legal uncertainties involve the application of significant estimates and judgments by management regarding the potential outcomes of future events.

29. Employee benefits

a) Employee postretirements obligations

In Brazil, the management of the pension plans is the responsibility of Fundação Vale do Rio Doce de Seguridade Social ("Valia") a nonprofit entity with administrative and financial autonomy. The Brazilian plans are as follows:

Benefit plan Vale Mais ("Vale Mais") and benefit plan Valiaprev ("Valiaprev")—Certain Company's employees are participants of Vale Mais and Valiaprev plans with components of defined benefits (specific coverage for death, pensions and disability allowances) and components of defined contributions (for programmable benefits). The defined benefits plan is subject to actuarial evaluations. The defined contribution plan represents a fixed amount held on behalf of the participants. Both Vale Mais and Valiaprev were overfunded as at December 31, 2019 and 2018.

Defined benefit plan ("Plano BD")—The Plano BD has been closed to new entrants since the year 2000, when the Vale Mais plan was implemented. It is a plan that has defined benefit characteristics, covering almost exclusively retirees and their beneficiaries. It was overfunded as of December 31, 2019 and 2018 and the contributions made by the Company are not material.

"Abono complementação" benefit plan—The Company sponsors a specific group of former employees entitled to receive additional benefits from Valia regular payments plus post-retirement benefits that covers medical, dental and pharmaceutical assistance. The contributions made by the Company finished in 2014. The "*abono complementação*" benefit was overfunded as at December 31, 2019 and 2018.

Other benefits—The Company sponsors medical plans for employees that meet specific criteria and for employees who use the "*abono complementação*" benefit. Although those benefits are not specific retirement plans, actuarial calculations are used to calculate future commitments. As those benefits are

Notes to the Financial Statements (Continued)
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29. Employee benefits (Continued)

related to health care plans they have the nature of underfunded benefits, and are presented as underfunded plans as at December 31, 2019 and 2018.

The Foreign plans are managed in accordance with their region. They are divided between plans in Canada, United States of America, United Kingdom, Indonesia, New Caledonia, Japan and Taiwan. Pension plans in Canada are composed of a defined benefit and defined contribution component. Currently the defined benefit plans do not allow new entrants. The foreign defined benefit plans are underfunded as at December 31, 2019 and 2018.

Employers' disclosure about pensions and other post-retirement benefits on the status of the defined benefit elements of all plans is provided as follows.

i. Change in benefit obligation

	Overfunded pension plans	Underfunded pension plans	Other benefits
Benefit obligation as at December 31, 2017	3,397	4,470	1,410
Service costs	5	101	36
Interest costs	282	158	59
Benefits paid	(296)	(272)	(60)
Participant contributions	-	(11)	-
Effect of changes in the actuarial assumptions	679	(164)	(32)
Translation adjustment	(490)	(353)	(133)
Benefit obligation as at December 31, 2018	3,577	3,929	1,280
Service costs	6	55	10
Interest costs	305	153	59
Benefits paid	(433)	(249)	(62)
Participant contributions	-	-	-
Effect of changes in the actuarial assumptions	718	373	176
Translation adjustment	(167)	160	42
Benefit obligation as at December 31, 2019	4,006	4,421	1,505

Notes to the Financial Statements (Continued)
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29. Employee benefits (Continued)

ii. Evolution of assets fair value

	Overfunded pension plans	Underfunded pension plans	Other benefits
Fair value of plan assets as at December 31, 2017 ..	4,828	3,776	-
Interest income	406	127	-
Employer contributions	35	49	60
Participant contributions	2	-	-
Benefits paid	(296)	(247)	(60)
Return on plan assets (excluding interest income) ..	479	(145)	-
Translation adjustment	(717)	(287)	-
Fair value of plan assets as at December 31, 2018 ..	4,737	3,273	-
Interest income	416	123	-
Employer contributions	27	56	62
Participant contributions	-	-	-
Benefits paid	(433)	(247)	(62)
Return on plan assets (excluding interest income) ..	757	382	-
Translation adjustment	(200)	139	-
Fair value of plan assets as at December 31, 2019 ..	5,304	3,726	-

iii. Reconciliation of assets and liabilities recognized in the statement of financial position

	Plans in Brazil					
	December 31, 2019			December 31, 2018		
	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits
Balance at beginning of the year	1,220	-	-	1,431	-	-
Interest income	110	-	-	124	-	-
Changes on asset ceiling	59	-	-	(113)	-	-
Translation adjustment	(91)	-	-	(222)	-	-
Balance at end of the year	1,298	-	-	1,220	-	-
Amount recognized in the statement of financial position						
Present value of actuarial liabilities ...	(4,006)	(412)	(303)	(3,517)	(334)	(249)
Fair value of assets	5,304	163	-	4,737	162	-
Effect of the asset ceiling	(1,298)	-	-	(1,220)	-	-
Liabilities	-	(249)	(303)	-	(172)	(249)
Current liabilities	-	(7)	(20)	-	(4)	(19)
Non-current liabilities	-	(242)	(283)	-	(168)	(230)
Liabilities	-	(249)	(303)	-	(172)	(249)

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

iv. Costs recognized in the income statement

	Year ended December 31								
	2019			2018			2017		
	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits
Service cost	7	55	10	5	101	36	7	86	30
Interest on expense on liabilities...	317	153	57	282	158	59	360	183	67
Interest income on plan assets	(432)	(123)	–	(406)	(127)	–	(513)	(151)	–
Interest expense on effect of (asset ceiling)/ onerous liability ..	114	–	–	124	–	–	152	–	–
Total of cost, net	6	85	67	5	132	95	6	118	97

v. Costs recognized in the statement of comprehensive income

	Year ended December 31								
	2019			2018			2017		
	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits
Balance at beginning of the year ..	(166)	(468)	(128)	(163)	(496)	(189)	(153)	(496)	(160)
Effect of changes actuarial assumptions	(718)	(373)	(176)	(679)	172	32	(65)	(167)	(27)
Return on plan assets (excluding interest income).....	757	385	–	479	(144)	–	–	167	–
Change of asset ceiling	(60)	–	–	172	–	–	47	–	–
Others.....	–	–	–	(1)	–	(1)	(3)	–	(14)
	(21)	12	(176)	(29)	28	31	(21)	–	(41)
Deferred income tax	7	(5)	63	10	(7)	(8)	7	(3)	12
Others comprehensive income	(14)	7	(113)	(19)	21	23	(14)	(3)	(29)
Translation adjustments.....	7	2	3	23	11	10	4	4	1
Transfers/ disposal	–	–	–	(7)	(4)	28	–	(1)	(1)
Accumulated other comprehensive income.....	(173)	(459)	(238)	(166)	(468)	(128)	(163)	(496)	(189)

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

vi. Risks related to plans

The Administrators of the plans have committed to strategic planning to strengthen internal controls and risk management. This commitment is achieved by conducting audits and assessments of internal controls, which aim to mitigate operational market and credit risks. Risks are presented as follow:

Legal—lawsuits: issuing periodic reports to internal audit and directors contemplating the analysis of lawyers about the possibility of loss (remote, probable or possible), aiming to support the administrative decision regarding provisions. Analysis and ongoing monitoring of developments in the legal scenario and its dissemination within the institution in order to subsidize the administrative plans, considering the impact of regulatory changes.

Actuarial—the annual actuarial valuation of the benefit plans comprises the assessment of costs, revenues and adequacy of plan funding. It also considers the monitoring of biometric, economic and financial assumptions (asset volatility, changes in interest rates, inflation, life expectancy, salaries and other).

Market—profitability projections are performed for the various plans and profiles of investments for 10 years in the management study of assets and liabilities. These projections include the risks of investments in various market segments. Furthermore, the risks for short-term market of the plans are monitored monthly through metrics of VaR (Value at Risk) and stress testing. For exclusive investment funds of Valia, the market risk is measured daily by the custodian asset bank.

Credit—assessment of the credit quality of issuers by hiring expert consultants to evaluate financial institutions and internal assessment of payment ability of non-financial companies. For assets of non-financial companies, the assessment is conducted a monitoring of the company until the maturity of the security.

vii. Actuarial and economic assumptions and sensitivity analysis

All calculations involve future actuarial projections about some parameters, such as: salaries, interest, inflation, the trend of social security in Brazil (“INSS”) benefits, mortality and disability.

The economic and actuarial assumptions adopted have been formulated considering the long-term period for maturity and should therefore be analyzed accordingly. In the short term they may not be realized.



Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

The following assumptions were adopted in the assessment:

	December 31, 2019			December 31, 2018		
	Overfunded pension plans	Underfunded pension plans	Other benefits	Overfunded pension plans	Underfunded pension plans	Other benefits
	Brazil					
Discount rate to determine benefit obligation	6,99% - 7,32%	7.10%	6,99% - 7,39%	8.86% - 9.10%	9.10%	9.05% - 9.29%
Nominal average rate to determine expense/ income	6,99% - 7,32%	7.10%	N/A	8.86% - 9.10%	9.10%	N/A
Nominal average rate of salary increase	5.88%	6.00%	N/A	4,00% - 6,08%	6.08%	N/A
Nominal average rate of benefit increase	3.80%	6.00%	N/A	4.00%	6.08%	N/A
Immediate health care cost trend rate	N/A	N/A	6.91%	N/A	N/A	7.12%
Ultimate health care cost trend rate	N/A	N/A	6.91%	N/A	N/A	7.12%
Nominal average rate of price inflation	3.80%	4.00%	3.80%	4.00%	4.00%	4.00%
Foreign						
	December 31, 2019		December 31, 2018			
	Underfunded pension plans	Other benefits	Underfunded pension plans	Other benefits		
Discount rate to determine benefit obligation	2.96%	3.04%	3.56%	3.66%		
Nominal average rate to determine expense/ income	3.57%	3.66%	3.26%	3.44%		
Nominal average rate of salary increase	3.17%	N/A	3.20%	N/A		
Nominal average rate of benefit increase	3.00%	N/A	3.00%	N/A		
Immediate health care cost trend rate	N/A	5.58%	N/A	5.90%		
Ultimate health care cost trend rate	N/A	4.55%	N/A	4.56%		
Nominal average rate of price inflation	2.10%	N/A	2.10%	N/A		

For the sensitivity analysis, the Company applies the effect of 1.0% in nominal discount rate to the present value of the Company's actuarial liability. The effects of this analysis on the Company's actuarial liability and assumptions adopted are as follows:

	December 31, 2019		
	Overfunded pension plans	Underfunded pension plans	Other benefits
Nominal discount rate—1.0% increase			
Effect on actuarial liability balance	3,666	3,901	1,316
Assumptions made	8.18%	4.35%	4.87%
Nominal discount rate—1.0% reduction			
Effect on actuarial liability balance	4,412	5,026	1,747
Assumptions made	6.18%	2.35%	2.87%

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

viii. Assets of pension plans

Brazilian plan assets as at December 31, 2019 and 2018 includes respectively (i) investments in a portfolio of Vale's stock and other instruments in the amount of US\$27 and US\$13, which are presented as "Investments funds—Equity" and (ii) Brazilian Federal Government securities in the amount of US\$4,523 and US\$4,199, which are presented as "Debt securities governments" and "Investments funds—Fixed"

Foreign plan assets as at December 31, 2019 and 2018 includes Canadian Government securities in the amount of US\$633 and US\$674, respectively.

ix. Overfunded pension plans

Assets by category are as follows:

	December 31, 2019				December 31, 2018			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Debt securities—Corporate	–	48	–	48	–	47	–	47
Debt securities—Government	2,716	–	–	2,716	2,447	–	–	2,447
Investments funds—Fixed Income	2,668	–	–	2,668	2,441	–	–	2,441
Investments funds—Equity	556	–	–	556	450	–	–	450
International investments	28	–	–	28	25	–	–	25
Structured investments—Private Equity funds	–	–	157	157	–	–	159	159
Structured investments—Real estate funds	160	–	17	177	–	–	15	15
Real estate	–	–	323	323	–	–	339	339
Loans to participants	–	–	141	141	–	–	160	160
Total	6,128	48	638	6,814	5,363	47	673	6,083
Funds not related to risk plans(i)				(1,510)				(1,346)
Fair value of plan assets at end of year				5,304				4,737

(i) Financial investments not related to coverage of overfunded pension plans. Funds are related to the Company's unconsolidated entities and former employees.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

Measurement of overfunded plan assets at fair value with no observable market variables (level 3) are as follows:

	Private equity funds	Real estate funds	Real estate	Loans to participants	Total
Balance as at December 31, 2017	196	15	365	224	800
Return on plan assets	15	–	39	25	79
Assets purchases	2	2	7	233	244
Assets sold during the year	(26)	–	(16)	(292)	(334)
Translation adjustment	(28)	(2)	(56)	(30)	(116)
Balance as at December 31, 2018	159	15	339	160	673
Return on plan assets	8	–	8	19	35
Assets purchases	1	2	4	46	53
Assets sold during the year	(4)	–	(13)	(79)	(96)
Translation adjustment	(7)	–	(15)	(5)	(27)
Balance as at December 31, 2019	157	17	323	141	638

x. Underfunded pension plans

Assets by category are as follows:

	December 31, 2019				December 31, 2018			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	–	56	–	56	3	18	–	21
Equity securities	1,409	2	–	1,411	1,186	2	–	1,188
Debt securities—Corporate	–	507	–	507	–	374	–	374
Debt securities—Government	156	634	–	790	116	680	–	796
Investments funds—Fixed Income	49	339	–	388	42	296	–	338
Investments funds—Equity	2	135	–	137	–	124	–	124
Structured investments—Private Equity funds	–	–	212	212	–	–	213	213
Real estate	–	–	55	55	–	–	51	51
Loans to participants	–	–	3	3	–	–	3	3
Others	2	–	165	167	–	–	165	165
Total	1,618	1,673	435	3,726	1,347	1,494	432	3,273

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

Measurement of underfunded plan assets at fair value with no observable market variables (level 3) are as follows:

	Private equity funds	Real estate	Loans to participants	Others	Total
Balance as at December 31, 2017	197	44	5	195	441
Return on plan assets	32	3	-	(15)	20
Assets purchases	22	18	-	-	40
Assets sold during the year	(22)	(10)	(1)	-	(33)
Translation adjustment	(16)	(4)	(1)	(15)	(36)
Balance as at December 31, 2018	213	51	3	165	432
Return on plan assets	11	4	-	5	20
Assets purchases	18	-	-	-	18
Assets sold during the year	(32)	-	(1)	(4)	(37)
Translation adjustment	2	-	1	(1)	2
Balance as at December 31, 2019	212	55	3	165	435

xi. Disbursement of future cash flow

Vale expects to disburse US\$105 in 2020 in relation to pension plans and other benefits.

xii. Expected benefit payments

The expected benefit payments, which reflect future services, are as follows:

	December 31, 2019		
	Overfunded pension plans	Underfunded pension plans	Other benefits
2020.....	259	235	65
2021.....	266	236	66
2022.....	273	238	68
2023.....	280	240	70
2024.....	285	242	73
2025 and thereafter	1,494	1,206	381

b) Profit sharing program ("PLR")

The Company recorded as cost of goods sold and services rendered and other operating expenses related to the profit sharing program US\$289, US\$503 and US\$780 for the years ended on December 31, 2019, 2018 and 2017, respectively.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

c) Long-term compensation plan

For the long-term awarding of eligible executives, the Company compensation plans includes Matching Program and Performance Share Unit Program—PSU, with three to four years-vesting cycles, respectively, with the aim of encouraging employee's retention and stimulating their performance.

For the Matching program, the participants can acquire Vale's common shares in the market without any benefits being provided by Vale. If the shares acquired are held for a period of three years and the participants keep it employment relationship with Vale, the participant is entitled to receive from Vale an award in shares, equivalent to the number of shares originally acquired by the executive. It should be noted that, although a specific custodian of the shares is defined by Vale, the share initially purchased by the executives have no restriction and can be sold at any time. However, if it's done before the end of the three-year-vesting period, they lose the entitlement of receiving the related award paid by Vale.

For PSU program, the eligible executives have the opportunity to receive during a four year-vesting cycle, an award equivalent to the market value of a determined number of common shares and conditioned to Vale's performance factor measured as an indicator of total return to the shareholders (TSR). This award is paid in cash and can occur in cumulative installments of 20% (at the end of 2nd year), 30% (at the end of 3rd year) and 50% (at the end of 4th year), conditioned to the performance factor of each year.

Liabilities of the plans are measured at fair value at every reporting period, based on market rates. Compensation costs incurred are recognized by the defined vesting period of three or four years. For the years ended December 31, 2019, 2018 and 2017 the Company recognized in the income statement the amounts of US\$39, US\$95 and US\$65, respectively, related to long-term compensation plan.

Accounting policy

Employee benefits

i. Current benefits—wages, vacations and related taxes

Payments of benefits such as wages or accrued vacation, as well the related social security taxes over those benefits are recognized monthly in income, on an accruals basis.

ii. Current benefits—profit sharing program

The Company has the Annual Incentive Program (AIP) based on Team and business unit's contribution and Company-wide performance through operational cash generation. The Company makes an accrual based on evaluation periodic of goals achieved and Company result, using the accrual basis and recognition of present obligation arising from past events in the estimated outflow of resources in the future. The accrual is recorded as cost of goods sold and services rendered or operating expenses in accordance with the activity of each employee.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

29. Employee benefits (Continued)

iii. Non-current benefits—long-term incentive programs

The Company has established a procedure for awarding certain eligible executives (Matching and Virtual Shares Programs) with the goal of encouraging employee retention and optimum performance. Plan liabilities are measured at each reporting date, at their fair values, based on market prices. Obligations are measured at each reporting date, at fair values based on market prices. The compensation costs incurred are recognized in income during the vesting period as defined.

iv. Non-current benefits—pension costs and other post-retirement benefits

The Company has several retirement plans for its employees.

For defined contribution plans, the Company's obligations are limited to a monthly contribution linked to a pre-defined percentage of the remuneration of employees enrolled in to these plans.

For defined benefit plans, actuarial calculations are periodically obtained for liabilities determined in accordance with the Projected Unit Credit Method in order to estimate the Company's obligation. The liability recognized in the statement of financial position represents the present value of the defined benefit obligation as at that date, less the fair value of plan assets. The Company recognized in the income statement the costs of services, the interest expense of the obligations and the interest income of the plan assets. The remeasurement of gains and losses, return on plan assets (excluding the amount of interest on return of assets, which is recognized in income for the year) and changes in the effect of the ceiling of the active and onerous liabilities are recognized in comprehensive income for the year.

For overfunded plans, the Company does not recognize any assets or benefits in the statement of financial position or income statement until such time as the use of the surplus is clearly defined. For underfunded plans, the Company recognizes actuarial liabilities and results arising from the actuarial valuation.

Critical accounting estimates and judgments

Post-retirement benefits for employees—The amounts recognized depend on a number of factors that are determined based on actuarial calculations using various assumptions in order to determine costs and liabilities. One of these assumptions is selection and use of the discount rate. Any changes to these assumptions will affect the amount recognized.

At the end of each year the Company and external actuaries review the assumptions that will be used for the following year. These assumptions are used in determining the fair values of assets and liabilities, costs and expenses and the future values of estimated cash outflows, which are recorded in the plan obligations.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

30. Stockholders' equity

a) Share capital

As at December 31, 2019, the share capital was US\$61,614 corresponding to 5,284,474,782 shares issued and fully paid without par value.

	December 31, 2019		
	Common shares	Golden shares	Total
Stockholders			
Litel Participações S.A. and Litela Participações S.A.	980,605,889	-	980,605,889
BNDDES Participações S.A.	323,496,276	-	323,496,276
Bradespar S.A.	293,907,266	-	293,907,266
Mitsui & Co., Ltd	286,347,055	-	286,347,055
Foreign investors—ADRs	1,150,143,671	-	1,150,143,671
Foreign institutional investors in local market	1,164,475,058	-	1,164,475,058
FMP—FGTS	46,807,292	-	46,807,292
PIBB—Fund.	2,473,749	-	2,473,749
Institutional investors	567,027,304	-	567,027,304
Retail investors in Brazil	312,998,897	-	312,998,897
Brazilian Government (Golden Share).....	-	12	12
Shares outstanding	5,128,282,457	12	5,128,282,469
Shares in treasury	156,192,313	-	156,192,313
Total issued shares	5,284,474,770	12	5,284,474,782
Share capital per class of shares (in millions)	61,614	-	61,614
Total authorized shares	7,000,000,000	-	7,000,000,000

The Company used 2,024,059 of its treasury shares to pay the Matching program of its eligible executives, except for those whose variable remuneration was suspended as described in note 5, in the amount of US\$22. It was recognized as "assignment and transfer of shares".

The Board of Directors may, regardless of changes to by-laws, issue new common shares (up to the total authorized shares), including the capitalization of profits and reserves to the extent authorized.

The Company holds shares in treasury for future sale or cancellation. These shares are recorded in a specific account as a reduction of stockholders' equity at their acquisition value and carried at cost. These programs are approved by the Board of Directors with a determined terms and numbers of shares.

Incremental costs directly attributable to the issue of new shares or options are recognized in stockholders' equity as a deduction from the amount raised, net of taxes.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

30. Stockholders' equity (Continued)

b) Remuneration to the Company's stockholders

The Company's by-laws determine the minimum remuneration to stockholders of 25% of net income, after appropriations to legal reserve and tax incentive reserve, as follows:

	2019
Loss	(1,683)
Minimum mandatory remuneration	-
	(1,683)
Profit reserves as at December 31, 2018	10,968
Allocation of loss	(1,683)
Remuneration—Interest on capital	(1,767)
Translation adjustment	(428)
Profit reserves as at December 31, 2019	7,090

In December 2019, the Board of Directors approved the declaration of interest on capital in the total gross amount of US\$1,767 (R\$7,253 million), equivalent to R\$1,414364369 per share, based on profit reserves. The payment will be decided later, after the return of the Shareholder Remuneration Policy, which has been suspended since the Brumadinho dam failure (as described on note 3).

The remuneration paid to stockholders based on the on interest on capital and dividends during 2018 was amounted of US\$3,313 (US\$0.636637439 per share).

c) Profit reserves

The amount of profit reserves is distributed as follows:

	Legal reserve	Tax incentive reserve	Investments reserve	Total of profit reserves
Balance as at December 31, 2017	1,630	580	5,209	7,419
Allocation of income	343	401	4,062	4,806
Translation adjustment	(251)	(99)	(907)	(1,257)
Balance as at December 31, 2018	1,722	882	8,364	10,968
Allocation of loss	-	-	(1,683)	(1,683)
Dividends and interest on capital of Vale's stockholders	-	-	(1,767)	(1,767)
Translation adjustment	(66)	(34)	(328)	(428)
Balance as at December 31, 2019	1,656	848	4,586	7,090

Legal reserve—Is a legal requirement for Brazilian public companies to retain 5% of the annual net income up to 20% of the capital. The reserve can only be used to compensate losses or to increase capital.

Tax incentive reserve—Results from the option to designate a portion of the income tax for investments in projects approved by the Brazilian Government as well as tax incentives.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

30. Stockholders' equity (Continued)

Investment reserve—Aims to ensure the maintenance and development of the main activities that comprise the Company's operations and to retain budgeted capital for investments. Based on the Company's by-laws, this reserve is capped to 50% of the annual distributable net income, up to the amount of the share capital. The remaining balance over than 50% of the annual distributable net income is retained based on the capital investments budget submitted for approval in the Stockholder's Meeting, pursuant to article 196 of the Law 6,404.

d) Others reserves

	Retirement benefit obligations	Fair value adjustment to investment in equity securities	Results on conversion of shares	Net ownership changes in subsidiaries	Total of other reserves
Balance as at December 31, 2017.....	(845)	-	(490)	(954)	(2,289)
Other comprehensive income.....	41	60	-	(16)	85
Translation adjustment.....	49	-	-	-	49
Balance as at December 31, 2018.....	(755)	60	(490)	(970)	(2,155)
Other comprehensive income.....	(126)	(184)	-	-	(310)
Translation adjustment.....	12	-	-	-	12
Acquisitions and disposal of noncontrolling interest.....	-	-	-	343	343
Balance as at December 31, 2019.....	(869)	(124)	(490)	(627)	(2,110)

e) Share buyback program

The Company concluded in November 2018, share buyback program for Vale's common shares and their respective ADSs approved by the Board of Directors on July 25, 2018, and repurchased a total of 71,173,683 common shares, at an average price of US\$14.05 per share, for a total aggregate purchase price of US\$1,000. The shares were acquired in the stock market based on regular trading conditions. The shares acquired are held in treasury for future sale or cancellation.

f) Vale's corporate governance restructuring in 2017

At the General Extraordinary Stockholders' Meeting, held on June 27, 2017, stockholders approved the corporate restructuring of the Company proposed by Valepar S.A. (former controlling stockholder). The corporate restructuring was based on (i) conversion of Vale class "A" preferred shares into common shares; (ii) amendment of Vale's by-laws, so as to adjust to Novo Mercado rules; and (iii) the merger of Valepar S.A. into Vale.

g) Shareholders Agreement

On the date of the merger of Valepar into Vale, August 14, 2017, the former Controlling Shareholders of Valepar executed a new shareholders' agreement ("Vale Agreement") that binds only 20% of the totality

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

30. Stockholders' equity (Continued)

of Vale's common shares issued by Vale, and will be in force until November 9, 2020, with no provision for renewal.

Accounting policy

Stockholder's remuneration—The stockholder's remuneration is paid on dividends and interest on capital. This remuneration is recognized as a liability in the financial statements of the Company based on bylaws. Any amount above the minimum mandatory remuneration approved by the by-laws shall only be recognized in current liabilities on the date that is approved by stockholders.

The Company is permitted to distribute interest attributable to stockholders' equity. The calculation is based on the stockholders' equity amounts as stated in the statutory accounting records and the interest rate applied may not exceed the Brazilian Government Long-term Interest Rate ("TJLP") determined by the Central Bank of Brazil. Also, such interest may not exceed 50% of the net income for the year or 50% of retained earnings plus profit reserves as determined by Brazilian corporate law.

The benefit to the Company, as opposed to making a dividend payment, is a reduction in the income tax burden because this interest charge is tax deductible in Brazil. Income tax of 15% is withheld on behalf of the stockholders relative to the interest distribution. Under Brazilian law, interest attributed to stockholders' equity is considered as part of the annual minimum mandatory dividend. This notional interest distribution is treated for accounting purposes as a deduction from stockholders' equity in a manner similar to a dividend and the tax deductibility recorded in the income statement.

31. Related parties

The Company's related parties are subsidiaries, joint ventures, associates, stockholders and its related entities and key management personnel of the Company. Transactions between the parent company and its subsidiaries are eliminated on consolidation and are not disclosed in this note.

Related party transactions were made by the Company on terms equivalent to those that prevail in arm's-length transactions, with respect to price and market conditions that are no less favorable to the Company than those arranged with third parties.

Purchases, accounts receivable and other assets, and accounts payable and other liabilities relate largely to amounts charged by joint ventures and associates related to the pelletizing plants operational lease and railway transportation services.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

31. Related parties (Continued)

Information about related party transactions and effects on the financial statements is set out below:

a) Transactions with related parties

	Year ended December 31			
	2019			
	Joint Ventures	Associates	Major stockholders	Total
Net operating revenue	374	294	204	872
Cost and operating expenses	(1,749)	(32)	–	(1,781)
Financial result	49	(1)	(29)	19

	Year ended December 31			
	2018			
	Joint Ventures	Associates	Major stockholders	Total
Net operating revenue	352	309	207	868
Cost and operating expenses	(2,269)	(39)	–	(2,308)
Financial result	115	–	(115)	–

	Year ended December 31			
	2017			
	Joint Ventures	Associates	Major stockholders	Total
Net operating revenue	399	337	146	882
Cost and operating expenses	(1,943)	(29)	(29)	(2,001)
Financial result	118	(14)	(819)	(715)

Net operating revenue relates to sale of iron ore to the steelmakers and right to use capacity on railroads. Cost and operating expenses mostly relates to the leases of the pelletizing plants.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

31. Related parties (Continued)

b) Outstanding balances with related parties

	December 31, 2019				December 31, 2018			
	Joint Ventures	Associates	Major stockholders(i)	Total	Joint Ventures	Associates	Major stockholders(i)	Total
Assets								
Cash and cash equivalents.....	–	–	1,384	1,384	–	–	1,256	1,256
Accounts receivable.....	91	22	5	118	110	42	3	155
Dividends receivable.....	83	6	–	89	132	–	–	132
Loans.....	1,919	–	–	1,919	1,976	–	–	1,976
Derivatives financial instruments.....	–	–	42	42	–	–	297	297
Other assets.....	65	–	–	65	25	–	–	25
Liabilities								
Supplier and contractors.....	302	28	37	367	221	21	24	266
Loans.....	–	1,367	1,688	3,055	–	1,325	2,650	3,975
Derivatives financial instruments.....	–	–	64	64	–	–	112	112
Other liabilities.....	569	–	–	569	769	–	–	769

(i) Refers to regular financial instruments with large financial institutions of which the stockholders are part of the controlling "shareholders' agreement".

Loans

In March 2018, Nacala BV, a joint venture between Vale and Mitsui on the Nacala's logistic corridor, closed the project financing and repaid a portion of the shareholders loans from Vale, in the amount of US\$2,572. The outstanding receivable of US\$1,919 carries interest at 7.44% p.a.

The loan from associates mainly relates to the loan from Pangea Emirates Ltd, part of the group of shareholders which owns 15% interest on Vale Moçambique which carries interest at 6.54% p.a.

Major stockholders

Refers to regular financial instruments with large financial institutions of which the stockholders are part of the controlling "shareholders' agreement".

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

31. Related parties (Continued)

c) The key management personnel remuneration

	Year ended December 31		
	2019	2018	2017
Short-term benefits			
Wages	8	8	10
Direct and indirect benefits	11	11	10
Profit sharing program ("PLR").....	1	10	8
	<u>20</u>	<u>29</u>	<u>28</u>
Long-term benefits			
Shares based	–	3	5
Severance	<u>4</u>	<u>20</u>	<u>19</u>
	<u><u>24</u></u>	<u><u>52</u></u>	<u><u>52</u></u>

The amounts described above include the Board of Directors and the Executive Officers and are presented on a cash basis.

32. Commitments

a) Contractual obligations

The required and non-cancelable minimum payments related to contractual obligations as at December 31, 2019 are as follows:

	Purchase obligations(i)	
	December 31, 2019	December 31, 2018
2020	3,956	2,677
2021	1,029	1,445
2022	710	548
2023	552	463
2024 and thereafter	2,830	2,194
Total minimum payments required	<u><u>9,077</u></u>	<u><u>7,327</u></u>

(i) Mainly relates to agreements for the acquisition of fuel, energy and the acquisition of raw materials and services.

b) Guarantees provided

As at December 31, 2019 and 2018, corporate financial guarantees provided by Vale (within the limit of its direct or indirect interest) for certain associates and joint ventures were US\$1,655 and US\$1,735, respectively. The fair value of this financial guarantees in December 31, 2019 and 2018 totaled US\$525 and US\$166, respectively, and is recorded in the balance sheet as "Others non-current liabilities".

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

33. Financial and capital risk management

Vale considers that an effective risk management is key to support the achievement of the company objectives and to ensure the financial strength and flexibility of the company and the business continuity.

Therefore, Vale has developed its risk management strategy in order to provide an integrated approach of the risks that the company is exposed to, considering not only the risks generated by variables traded in financial markets (market risk) and those arising from liquidity risk, but also risk from counterparties obligations (credit risk), among others.

The Company's Board of Directors oversees the management of financial risks and it is supported by a Finance Committee that advises on financial risks and the appropriate financial risk governance framework for the Company. The Finance Committee provides assurance to the Company's Board of Directors that Vale's financial activities are governed by appropriate policies and procedures and that financial risks are identified, measured and managed in accordance with the Company's policies and objectives.

a) Liquidity risk management

The liquidity risk arises from the possibility that Vale might not perform its obligations on due dates, as well as face difficulties to meet its cash requirements due to market liquidity constraints.

The revolving credit facilities available today were provided by a syndicate of several global commercial banks. To mitigate liquidity risk, Vale has two revolving credit facilities, which will mature in 2022 and 2024, in the available amount of US\$5,000 to assist the short term liquidity management and to enable more efficiency in cash management, being consistent with the strategic focus on cost of capital reduction. As of December 31, 2019 these lines are undrawn.

b) Credit risk management

Vale's exposure to credit risk arises 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.

(i) Commercial credit risk management

For the commercial credit exposure, which arises from sales to final customers, the risk management area, in accordance with the current delegation level, approves or requests the approval of credit risk limits for each counterparty.

Vale attributes an internal credit risk rating for each counterparty using its 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.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

33. Financial and capital risk management (Continued)

Based on the counterparty's credit risk, risk mitigation strategies may be used to manage the Company's credit risk. The main credit risk mitigation strategies include non-recourse sale of receivables, insurance instruments, letters of credit, corporate and bank guarantees, mortgages, among others.

Vale has a diversified accounts receivable portfolio from a geographical standpoint, with Asia, Europe and Brazil the regions with more significant exposures. According to each region, different guarantees can be used to enhance the credit quality of the receivables. In 2019 and 2018, the expected credit loss on the Company's accounts receivable portfolio is insignificant (see note 10).

(ii) Treasury credit risk management

To manage the credit exposure arising from cash investments and derivative instruments, credit limits are approved to each counterparty with whom the Company has credit exposure.

Furthermore, the Company controls the portfolio diversification and monitor different indicators of solvency and liquidity of the different counterparties that were approved for trading.

c) Market risk management

Vale is exposed to several market risk factors that can impact its cash flow. The assessment of this potential impact arising from the volatility of market risk factors and their correlations is performed periodically to support the decision-making process regarding the risk management strategy, that may incorporate financial instruments, including derivatives.

The portfolio of these financial instruments is monitored on a monthly basis, enabling financial results surveillance and its impact on cash flow.

Vale currently applies hedge accounting in the following programs: (i) net investment (see notes 6 and 25), and (ii) nickel revenue hedging program (see note 35).

Considering the nature of Vale's business and operations, the main market risk factors which the Company is exposed to are:

- Foreign exchange and interest rates;
- Product prices and input costs.

Foreign exchange and interest rate risk

Vale's cash flow is exposed to the volatility of several currencies against the U.S. dollar. While most of our product prices are indexed to U.S. dollars, most of our costs, disbursements and investments are indexed to currencies other than the U.S. dollar, principally the Brazilian real and the Canadian dollar. We also may have debt instruments and other assets and liabilities denominated in currencies other than U.S. dollars, mainly in Brazilian real and euros.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

33. Financial and capital risk management (Continued)

In order to reduce the potential impact that arises from currencies mismatches, derivatives instruments may be used as a risk mitigation strategy.

Vale implements hedge transactions to protect its cash flow against the market risks that arises from its debt obligations—mainly currency volatility. The hedges cover most of the debt denominated in Brazilian real and euros. The Company uses swap and forward transactions to convert debt linked to Brazilian real and Euros into US dollar, with volumes, flows and settlement dates similar to those of the debt instruments—or sometimes lower, subject to market liquidity conditions.

Hedging instruments with shorter settlement dates are renegotiated through time so that their final maturity matches—or becomes closer—to the debts' final maturity. At each settlement date, the results of the swap and forward transactions partially offset the impact of the foreign exchange rate in Vale's obligations, contributing to stabilize the cash disbursements in US dollar.

Vale has also exposure to interest rates risks over loans and financings. The US Dollar floating rate debt in the portfolio consists mainly of loans including export pre-payments, commercial banks and multilateral organizations loans. In general, such debt instruments are indexed to the LIBOR (London Interbank Offer Rate) in US dollar.

Risk of product and input prices

Vale is also exposed to market risks associated with the price volatility of commodities and inputs. 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 may incorporate derivative instruments, predominantly forwards, futures and options.

d) Capital structure management

The Company's policy aims at establishing a capital structure that will ensure the continuity of our business in the long term. Within this perspective, the Company has been able to deliver value to stockholders through dividend payments and capital gain, and at the same time maintain a debt profile suitable for its activities, with an amortization well distributed over the years, thus avoiding a concentration in one specific period.

34. Subsequent events

a) Coronavirus outbreak

The Coronavirus outbreak ("COVID-19") was first reported on December 30, 2019. The responses by various governments and international organizations which highlighted the severity of the outbreak occurred after December 31, 2019. Since then, there have been worldwide reports of contagion and

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

34. Subsequent events (Continued)

fatalities. On March 3, 2020, the outbreak was characterized as a Pandemic by the World Health Organization.

The COVID-19 outbreak has developed rapidly in 2020 and measures taken to contain the virus have affected economic activity, which in turn has implications on the Company's results of operations and cash flows. Although the COVID-19 existed at December 31, 2019, it is the severity of the virus and the responses to the outbreak which may have an impact on the entity's operations. These events arose after the reporting period, as such the outbreak is a non-adjusting event for the reporting period ending December 31, 2019 and no adjustment needs to be made to amounts recognized in the December 31, 2019 financial statements.

As the outbreak develops over the regions where Vale's operations are concentrated, the Company may face workforce related operational difficulties and may need to adopt contingency measures or eventually suspend operations. Also, a significant portion of the Company's revenue is originated from sales made to customers in Asia and Europe, and Vale as well rely on an extensive logistics and supply chain, including several ports, distribution centers and suppliers that have operations in affected regions. Abnormally large changes have occurred in the valuation of financial assets across many markets since December 31, 2019 meaning that the fair values of our assets and liabilities may change.

On March 16, 2020, the Company announced that as a precaution in the wake of COVID-19 to help protect the health and well-being of employees and the Nunatsiavut and Innu communities in Labrador, the decision was made to ramp down operations at Voisey's Bay and place it on care and maintenance for a period of four weeks. On March 23, 2020, the Company decided to temporarily halt, its distribution center in Malaysia (the Teluk Rubiah Maritime Terminal) as the Company is temporarily unable to secure the minimum resources to safely operate the terminal.

On March 24, 2020, the Company drew down its revolving credit facilities in the amount of US\$5 billion as a precautionary measure in order to increase its cash position and preserve financial flexibility in light of current uncertainty in the global markets resulting from the COVID-19 outbreak.

The Company is closely evaluating the impact of the COVID-19 on its business. The situation is evolving and could become material if there is significant supply chain disruption or customer demand declines. At this time, we have not suffered any material impact to our operations, logistics, or sales. However, the outbreak continues to be fluid and uncertain, making it impossible to forecast the final impact it could have on the global financial markets and economy, and in turn, on the Company's business, liquidity, and financial position.

b) Other acquisitions and divestitures

As disclosed on note 14 of these financial statements, the Company entered into agreements to sell its 25% interest in Henan Longyu and to divest 20% of its interest in PTVI. The closing of both transactions were expected in the first quarter of 2020. However, due to the recent developments of the COVID-19 outbreak, the closing of these transactions have been pushed back to later dates in 2020.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

34. Subsequent events (Continued)

c) U.S. Securities class action suits—Brumadinho Dam failure (note 3)

On December 13, 2019, Vale made a motion to dismiss the amended complaint and, in January 2020, the lead plaintiff filed an opposition to our motion to dismiss. On February 21, 2020, the Company filed a reply to the opposition. In March, the lead plaintiff has requested to start the partial discovery, for which the Company filed an opposition on March 20, 2020. The judge has not issued a decision to date.

Vale intends to defend against this action and mount a full defense against these claims. 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.

35. Additional information about derivatives financial instruments

The risk of the derivatives portfolio is measured using the delta-Normal parametric approach and considers that the future distribution of the risk factors and its correlations tends to present the same statistic properties verified in the historical data. The value at risk estimate considers a 95% confidence level for a one-business day time horizon.

The following tables detail the derivatives positions for Vale and its controlled companies as of December 31, 2019, with the following information: notional amount, fair value including credit risk, gains or losses in the period, value at risk and the fair value breakdown by year of maturity.

a) Foreign exchange and interest rates derivative positions

(i) Protection programs for the R\$ denominated debt instruments

To reduce cash flow volatility, swap and forward transactions were implemented to convert into US\$ the cash flows from certain debt instruments denominated in R\$ with interest rates linked mainly to CDI, TJLP and IPCA. In those swaps, Vale pays fixed or floating rates in US\$ and receives payments in R\$ linked to the interest rates of the protected debt instruments.

The swap and forward transactions were negotiated over-the-counter and the protected items are the cash flows from debt instruments linked to R\$. These programs transform into US\$ the obligations linked

Notes to the Financial Statements (Continued)
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35. Additional information about derivatives financial instruments (Continued)

to R\$ to achieve a currency offset in the Company's cash flows, by matching its receivables—mainly linked to US\$—with its payables.

Flow	Notional		Index	Average rate	Fair value		Financial Settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year		
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			2020	2021	2022+
CDI vs. US\$ fixed rate swap					(38)	(46)	(18)	8	(22)	2	(18)
Receivable	R\$ 2,115	R\$ 1,581	CDI	100.54%							
Payable	US\$ 558	US\$ 456	Fix	3.31%							
TJLP vs. US\$ fixed rate swap					(77)	(370)	(312)	9	(12)	(18)	(47)
Receivable	R\$ 2,111	R\$ 2,303	TJLP +	1.15%							
Payable	US\$ 601	US\$ 994	Fix	2.97%							
TJLP vs. US\$ floating rate swap					–	(56)	(59)	–	–	–	–
Receivable	–	R\$ 181	TJLP +	–							
Payable	US\$ 0	US\$ 107	Libor +	–							
R\$ fixed rate vs. US\$ fixed rate swap					(18)	(8)	8	8	13	(7)	(24)
Receivable	R\$ 2,173	R\$ 1,078	Fix	6.25%							
Payable	US\$ 604	US\$ 351	Fix	0.73%							
IPCA vs. US\$ fixed rate swap					46	(80)	(26)	14	12	(18)	52
Receivable	R\$ 2,826	R\$ 1,315	IPCA +	5.18%							
Payable	US\$ 759	US\$ 434	Fix	4.02%							
IPCA vs. CDI swap					104	89	6	–	58	4	42
Receivable	R\$ 1,634	R\$ 1,350	IPCA +	6.62%							
Payable	R\$ 1,350	R\$ 1,350	CDI	98.58%							

Flow	Notional		Bought / Sold	Average rate	Fair value		Financial Settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2020+
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Forward	R\$ 121	–	B	4.20	1	–	–	1	1

(ii) Protection program for EUR denominated debt instruments

To reduce the cash flow volatility, swap transactions were implemented to convert into US\$ the cash flows from certain debt instruments issued in Euros by Vale. In those swaps, Vale receives fixed rates in EUR and pays fixed rates in US\$.

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

35. Additional information about derivatives financial instruments (Continued)

The swap transactions were negotiated over-the-counter and the protected items are the cash flows from debt instruments linked to EUR. The financial settlement inflows/outflows are offset by the protected items' losses/gains due to EUR/US\$ exchange rate.

Flow	Notional			Average rate	Fair value		Financial Settlement Inflows (Outflows)	Value at Risk	Fair value by year			
	December 31, 2019	December 31, 2018	Index		December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2019	2020	2021
EUR fixed rate vs. US\$ fixed rate swap												
Receivable	€ 500	€ 500	Fix	3.75%	(35)	(1)	(5)	4	(6)	(5)	(24)	
Payable	US\$ 613	US\$ 613	Fix	4.29%								

(iii) Protection for treasury volatility related to tender offer transaction

To reduce the volatility of the premium to be paid to investors for the tender offer transaction issued on December 2019, treasury lock transactions were implemented and already settled.

Flow	Notional			Average rate	Fair value		Financial Settlement Inflows (Outflows)	Value at Risk	Fair value by year
	December 31, 2019	December 31, 2018	Bought / Sold		December 31, 2019	December 31, 2018			
Forwards	-	-	B	-	-	-	16	-	-

b) Commodities derivative positions

(i) Protection program for the purchase of fuel oil used on ships

In order to reduce the impact of fluctuations in fuel oil prices on the hiring and availability of maritime freight and, consequently, to reduce the Company's cash flow volatility, hedging operations were carried out through options contracts on Bunker Oil, Gasoil (10ppm) and Brent oil for different portions of the exposure.

The derivative transactions were negotiated over-the-counter and the protected item is part of the Vale's costs linked to the price of fuel oil used on ships. The financial settlement inflows/outflows are offset by the protected items' losses/gains.

Notes to the Financial Statements (Continued)
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35. Additional information about derivatives financial instruments (Continued)

Bunker Oil Options

Flow	Notional (ton)		Bought / Sold	Average strike (US\$/ton)	Fair value		Financial settlement Inflows (Outflows)	Value at Risk	Fair value by year
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2019	2020
Call options	-	2,100,000	B	-	-	1	2	-	-
Put options	-	2,100,000	S	-	-	(29)	-	-	-
Total					-	(28)	2	-	-

Brent Crude Oil Options

Flow	Notional (bbl.)		Bought / Sold	Average strike (US\$/bbl.)	Fair value		Financial settlement Inflows (Outflows)	Value at Risk	Fair value by year
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2019	2020
Call options	1,110,000	-	B	75	11	-	-	3	11
Put options	1,110,000	-	S	49	(3)	-	-	1	(3)
Total					8	-	-	4	8

Gasoil Options

Flow	Notional (bbl.)		Bought / Sold	Average strike (US\$/bbl.)	Fair value		Financial settlement Inflows (Outflows)	Value at Risk	Fair value by year
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2019	2020
Call options	1,035,000	-	B	96	7	-	-	1	6
Put options	1,035,000	-	S	61	(3)	-	-	1	(3)
Total					4	-	-	2	3

(ii) Protection programs for base metals raw materials and products

Operational Hedging Programs

In the operational hedging program for nickel sales at fixed prices, derivatives transactions were implemented to convert into floating prices the contracts with clients that required a fixed price.

In the operational protection program for the purchase of raw materials and products, derivatives transactions were implemented in order to reduce the mismatch between the pricing period of purchases (concentrate, cathode, sinter, scrap and others) and the pricing period of the final product sales to the clients.

Notes to the Financial Statements (Continued)
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35. Additional information about derivatives financial instruments (Continued)

All these transactions have already been settled.

Flow	Notional (ton)		Bought / Sold	Average strike (US\$/ton)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year	
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2019
Fixed price sales protection										
Nickel forwards	-	7,244	S	-	-	(10)	49	-	-	-
Raw material purchase protection										
Nickel forwards	-	120	S	-	-	-	(1)	-	-	-
Copper forwards	-	81	S	-	-	-	-	-	-	-
Total					-	(10)	48	-	-	-

Nickel Revenue Hedging Program

To reduce the volatility of its future cash flows arising from changes in nickel prices, the company implemented a Nickel Revenue Hedging Program. Under this program, hedge operations were executed using option contracts to protect a portion of the company highly probable forecast sales at floating prices, thus establishing a cushion to guarantee prices above our Nickel Average Unit Cash Cost and investments for the hedged volumes. A hedge accounting treatment is given to this program.

The derivative transactions under the program are negotiated over-the-counter and the financial settlement inflows/outflows are offset by the protected items' losses/gains due to nickel prices changes.

Flow	Notional (ton)		Bought / Sold	Average strike (US\$/ton)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year	
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2019
Call options	75,984	-	S	18,739	(12)	-	(2)	3	(10)	(3)
Put options	75,984	-	B	15,714	162	-	13	21	152	9
Total					150	-	11	24	142	6

c) Freight derivative positions

To reduce the impact of maritime freight price volatility on the Company's cash flow, freight hedging transactions were implemented, through Forward Freight Agreements (FFAs). The protected item is part of Vale's costs linked to maritime freight spot prices. The financial settlement inflows/outflows of the FFAs are offset by the protected items' losses/gains due to freight prices changes.

Notes to the Financial Statements (Continued)
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35. Additional information about derivatives financial instruments (Continued)

The FFAs are contracts traded over the counter and can be cleared through a Clearing House, in this case subject to margin requirements.

Flow	Notional (days)		Bought / Sold	Average strike (US\$/day)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2020
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Freight forwards	1,050	480	B	13,286	-	1	3	1	-

d) Wheaton Precious Metals Corp. warrants

The Company owns warrants issued by Wheaton Precious Metals Corp. (WPM), a Canadian company with stocks negotiated in Toronto Stock Exchange and New York Stock Exchange. Such warrants have payoff similar to that of an American call option and were received as part of the payment regarding the sale of part of gold payable flows produced as a sub product from Salobo copper mine and some nickel mines in Sudbury.

Flow	Notional (quantity of warranties)		Bought / Sold	Average strike (US\$/share)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2023
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Call options	10,000,000	10,000,000	B	44	26	8	-	3	26

e) Debentures convertible into shares of Valor da Logística Integrada ("VLI")

The Company has debentures which lenders have the option to convert the outstanding debt into a specified quantity of VLI's shares, owned by the Company. This option may be fully, or part exercised, upon payment to the Company of the strike price, considering the terms, conditions and other limitations existing in the agreement, at any time and at the discretion of the creditor, as of December 2017 until the maturity date of the debentures, December 2027.

Flow	Notional (quantity)		Bought / Sold	Average strike (R\$/share)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2027
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Conversion options	140,239	140,239	S	7,136	(51)	(59)	-	3	(51)

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

35. Additional information about derivatives financial instruments (Continued)

f) Options related to Minerações Brasileiras Reunidas S.A. (“MBR”) shares

In 2019, in connection to the acquisition of additional 36.4% MBR’s shares disclosed in note 14, the options were elapsed.

Flow	Notional (quantity, in millions)		Bought / Sold	Average strike (R\$/share)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2020+
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Options	-	2,139	B/S	-	-	279	-	-	-

g) Option related to SPCs Casa dos Ventos

The Company acquired in January 2019 a call option related to shares of the special purpose companies Ventos de São Bento Energias Renováveis, Ventos São Galvão Energias Renováveis and Ventos de Santo Eloy Energias Renováveis (SPCs Casa dos Ventos), which are part of the wind farm of Folha Larga Sul project, in Campo Formoso, Bahia, with commercial operation scheduled for the first half of 2020. This option was acquired in the context of the Company’s signing of electric power purchase and sale agreements with Casa dos Ventos, supplied by this wind farm.

Flow	Notional (quantity)		Bought / Sold	Average strike (R\$/share)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2022
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Call option	137,751,623	-	B	2.77	24	-	-	2	24

h) Embedded derivatives in contracts

In August 2014 the Company sold part of its stake in Valor da Logística Integrada (“VLI”) to an investment fund managed by Brookfield Asset Management (“Brookfield”). The sales contract includes a clause that establishes, under certain conditions, a minimum return guarantee on Brookfield’s investment until August 2020. This clause is considered an embedded derivative, with payoff equivalent to that of a put option.

Flow	Notional (quantity)		Bought / Sold	Average strike (R\$/share)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2020+
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Put option ...	1,105,070,863	1,105,070,863	S	4	(69)	(103)	-	11	(69)

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35. Additional information about derivatives financial instruments (Continued)

The Company has some nickel concentrate and raw materials purchase agreements in which there are provisions based on nickel and copper future prices behavior. These provisions are considered as embedded derivatives.

Flow	Notional (ton)		Bought / Sold	Average strike (US\$/ton)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year 2020
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			
Nickel forwards ...	1,497	3,763	S	15,363	2	2	-	1	2
Copper forwards ..	1,009	2,035	S	5,910	-	-	-	-	-
Total					<u>2</u>	<u>2</u>	<u>-</u>	<u>1</u>	<u>2</u>

The Company has also a natural gas purchase agreement in which there's a clause that defines that a premium can be charged if the Company's pellet sales prices trade above a pre-defined level. This clause is considered an embedded derivative.

Flow	Notional (volume/month)		Bought / Sold	Average strike (US\$/ton)	Fair value		Financial settlement Inflows (Outflows) December 31, 2019	Value at Risk December 31, 2019	Fair value by year	
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018			2020	2021+
Call options	746,667	746,667	S	233	(1)	(1)	-	1	(0.4)	(0.3)

i) Sensitivity analysis of derivative financial instruments

The following tables present the potential value of the instruments given hypothetical stress scenarios for the main market risk factors that impact the derivatives positions. The scenarios were defined as follows:

- *Probable*: the probable scenario was defined as the fair value of the derivative instruments as at December 31, 2019
- *Scenario I*: fair value estimated considering a 25% deterioration in the associated risk variables
- *Scenario II*: fair value estimated considering a 50% deterioration in the associated risk variables

Notes to the Financial Statements (Continued)
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35. Additional information about derivatives financial instruments (Continued)

Instrument	Instrument's main risk events	Probable	Scenario I	Scenario II
CDI vs. US\$ fixed rate swap	R\$ depreciation	(38)	(181)	(324)
	US\$ interest rate inside Brazil decrease	(38)	(42)	(46)
	Brazilian interest rate increase	(38)	(39)	(39)
Protected item: R\$ denominated debt	R\$ depreciation	n.a.	-	-
TJLP vs. US\$ fixed rate swap	R\$ depreciation	(77)	(229)	(382)
	US\$ interest rate inside Brazil decrease	(77)	(85)	(95)
	Brazilian interest rate increase	(77)	(95)	(113)
	TJLP interest rate decrease	(77)	(95)	(114)
Protected item: R\$ denominated debt	R\$ depreciation	n.a.	-	-
R\$ fixed rate vs. US\$ fixed rate swap	R\$ depreciation	(18)	(164)	(310)
	US\$ interest rate inside Brazil decrease	(18)	(23)	(29)
	Brazilian interest rate increase	(18)	(26)	(33)
Protected item: R\$ denominated debt	R\$ depreciation	n.a.	-	-
IPCA vs. US\$ fixed rate swap	R\$ depreciation	46	(153)	(352)
	US\$ interest rate inside Brazil decrease	46	31	15
	Brazilian interest rate increase	46	12	(20)
	IPCA index decrease	46	23	1
Protected item: R\$ denominated debt	R\$ depreciation	n.a.	-	-
IPCA vs. CDI swap	Brazilian interest rate increase	104	97	90
	IPCA index decrease	104	99	93
Protected item: R\$ denominated debt linked to IPCA	IPCA index decrease	n.a.	(99)	(93)
EUR fixed rate vs. US\$ fixed rate swap	EUR depreciation	(35)	(198)	(360)
	Euribor increase	(35)	(36)	(37)
	US\$ Libor decrease	(35)	(43)	(52)
	EUR depreciation	n.a.	(198)	360
Protected item: EUR denominated debt	R\$ depreciation	1	(7)	(15)
NDF BRL/USD	US\$ interest rate inside Brazil decrease	1	1	-
	Brazilian interest rate increase	1	-	(2)
	R\$ depreciation	n.a.	-	-
Protected item: R\$ denominated debt	R\$ depreciation	n.a.	-	-
Fuel Oil protection				
Options	Price input decrease	12	(69)	(115)
Protected item: Part of costs linked to fuel oil prices	Price input decrease	n.a.	69	115
Maritime Freight protection				
Forwards	Freight price decrease	-	(3)	(7)
Protected item: Part of costs linked to maritime freight prices	Freight price decrease	n.a.	3	7
Nickel Revenue Hedging Program				
Options	Nickel price increase	150	(31)	(224)
Protected item: Part of nickel future revenues	Nickel price increase	n.a.	31	224
Wheaton Precious Metals Corp. warrants	WPM stock price decrease	26	8	1
Conversion options—VLI	VLI stock value increase	(51)	(84)	(127)
Option—SPCs Casa dos Ventos	SPCs Casa dos Ventos stock value decrease	24	8	1

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

35. Additional information about derivatives financial instruments (Continued)

Instrument	Main risks	Probable	Scenario I	Scenario II
Embedded derivatives—Raw material purchase (nickel)	Nickel price increase	2	(3)	(8)
Embedded derivatives—Raw material purchase (copper)	Copper price increase	–	(2)	(3)
Embedded derivatives—Gas purchase	Pellet price increase	(1)	(2)	(5)
Embedded derivatives—Guaranteed minimum return (VLI)	VLI stock value decrease	(69)	(253)	(520)

j) Financial counterparties' ratings

The transactions of derivative instruments, cash and cash equivalents as well as short-term investments are held with financial institutions whose exposure limits are periodically reviewed and approved by the delegated authority. The financial institutions credit risk is performed through a methodology that considers, among other information, ratings provided by international rating agencies.

The table below presents the ratings published by agencies Moody's and S&P regarding the main financial institutions that we hire derivative instruments, cash and cash equivalents transactions.

<u>Long term ratings by counterparty</u>	<u>Moody's</u>	<u>S&P</u>
ABN Amro	A1	A
Agricultural Bank of China	A1	A
ANZ Australia and New Zealand Banking	Aa3	AA–
Banco ABC	Ba3	BB–
Banco Bradesco	Ba3	BB–
Banco do Brasil	Ba3	BB–
Banco Itaú Unibanco	Ba3	BB–
Banco Safra	Ba3	BB–
Banco Santander	A2	A
Banco Votorantim	Ba3	BB–
Bank Mandiri	Baa2	BBB–
Bank of America	A2	A–
Bank of China	A1	A
Bank of Montreal	Aa2	A+
Bank of Nova Scotia	A2	A+
Bank of Shanghai	Baa2	–
Bank of Tokyo Mitsubishi UFJ	A1	A–
Bank Rakyat Indonesia (BRI)	Baa2	BBB–
Barclays	Baa3	BBB
BBVA Banco Bilbao Vizcaya Argentaria	A3	A–
BNP Paribas	Aa3	A+
BTG Pactual	Ba3	BB–
Caixa Econômica Federal	Ba3	BB–
Calyon	Aa3	A+
China Construction Bank	A1	A
CIBC Canadian Imperial Bank	Aa2	A+
CIMB Bank	Baa1	A–
Citigroup	A3	BBB+
Credit Suisse	Baa2	BBB+
Deutsche Bank	A3	BBB+
Goldman Sachs	A3	BBB+

Notes to the Financial Statements (Continued)
Expressed in millions of United States dollar, unless otherwise stated

35. Additional information about derivatives financial instruments (Continued)

<u>Long term ratings by counterparty</u>	<u>Moody's</u>	<u>S&P</u>
HSBC	A2	A
Industrial and Commercial Bank of China	A1	A
Intesa Sanpaolo Spa	Baa1	BBB
Banco Itaú Unibanco	Ba3	BB –
JP Morgan Chase & Co	A2	A–
Macquarie Group Ltd	A3	BBB+
Mega International Commercial Bank	A1	A
Millenium BIM	A1	A–
Mitsui & Co	A1	A–
Mizuho Financial	A1	A–
Morgan Stanley	A3	BBB+
Muscat Bank	Ba2	BB
National Australia Bank	Aa3	AA –
National Bank of Canada	Aa3	A
National Bank of Oman	Ba2	–
Natixis	A1	A+
Royal Bank of Canada	Aa2	AA –
Rabobank	Aa3	A+
Societe Generale	A1	A
Standard Bank Group	Ba1	–
Standard Chartered	A2	BBB+
Sumitomo Mitsui Financial	A1	A–
Toronto Dominion Bank	Aa3	AA –
UBS	Aa3	A–
Unicredit	Baa1	BBB