Vale S.A.
Form 20-F
March 27, 2014

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**As filed with the Securities and Exchange Commission on March 27, 2014**

**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, 2013**
**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
phone: +55 21 3814 8888
fax: +55 21 3814 8820

**Avenida Graça Aranha, No. 26**
**20030-900 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** | **Name of Each Exchange on Which Registered** |
|---|---|
| Preferred class A shares of Vale, no par value per share | New York Stock Exchange* |
| American Depositary Shares (evidenced by American Depositary Receipts), each representing one preferred class A share of Vale | New York Stock Exchange |
| Common shares of Vale, no par value per share | New York Stock Exchange* |
| American Depositary Shares (evidenced by American Depositary Receipts), each representing one common share of Vale | New York Stock Exchange |
| 6.25% Guaranteed Notes due 2016, issued by Vale Overseas | New York Stock Exchange |
| 6.250% Guaranteed Notes due 2017, issued by Vale Overseas | New York Stock Exchange |
| 5.625% Guaranteed Notes due 2019, issued by Vale Overseas | New York Stock Exchange |
| 4.625% Guaranteed Notes due 2020, issued by Vale Overseas | New York Stock Exchange |
| 4.375% Guaranteed Notes due 2022, issued by Vale Overseas | New York Stock Exchange |
| 8.25% Guaranteed Notes due 2034, issued by Vale Overseas | New York Stock Exchange |
| 6.875% Guaranteed Notes due 2036, issued by Vale Overseas | New York Stock Exchange |
| 6.875% Guaranteed Notes due 2039, issued by Vale Overseas | New York Stock Exchange |
| 5.625% Notes due 2042, issued by Vale S.A. | 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, 2013 was:**

3,256,724,482 common shares, no par value per share
2,108,579,618 preferred class A 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 ý No o

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 o No ý

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 ý No o

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate website, if any, every Interactive Data File required to be submitted and posted 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 and post such files).

Yes ý No o

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, or a non-accelerated filer. See definition of "accelerated filer" and "large accelerated filer" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ý Accelerated filer o Non-accelerated filer o

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

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

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.

Item 17 o Item 18 o

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 o No ý

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**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:

our direction and future operation;

the implementation of our principal operating strategies, including our potential participation in acquisition, divestiture or joint venture transactions or other investment opportunities;

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 and demand for commodities;

the future impact of competition and regulation;

the payment of dividends or interest on shareholders' equity;

industry trends, including the direction of prices and expected levels of supply and demand;

other factors or trends affecting our financial condition or results of operations; and

the factors discussed under *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 (a) the countries in which we operate, especially Brazil and Canada, (b) the global economy, (c) capital markets, (d) the mining and metals businesses, which are cyclical in nature, and their dependence upon global industrial production, which is also cyclical, and (e) 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 *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.

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*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 Avenida Graça Aranha, No. 26, 20030-900 Rio de Janeiro, RJ,*

*Brazil, and its telephone number is 55-21-3814-4477.*

*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 "preferred shares" are to our preferred class A shares. References to our "ADSs" or "American Depositary Shares" include both our common American Depositary Shares (our "common ADSs"), each of which represents one common share of Vale, and our preferred class A American Depositary Shares (our "preferred ADSs"), each of which represents one class A preferred share of Vale. American Depositary Shares are represented by American Depositary Receipts ("ADRs") issued by the depositary. References to our "HDSs" or "Hong Kong Depositary Shares" include both our common Hong Kong Depositary Shares (our "common HDSs"), each of which represents one common share of Vale, and our class A preferred Hong Kong Depositary Shares (our "preferred HDSs"), each of which represents one preferred Class A share of Vale. Hong Kong Depositary Shares are represented by Hong Kong Depositary Receipts ("HDRs") issued by the depositary.*

*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 "CAD" are to Canadian dollars, and references to "A$" are to Australian dollars.*

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## RISK FACTORS

**Risks relating to our business**

*The mining industry is highly exposed to the cyclicality of global economic activity and requires significant investments of capital.*

The mining industry is primarily 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 and preserve the environment. Sensitivity to industrial production, together with the need for significant long-term capital investments, are important sources of risk for the financial performance and growth prospects of Vale and the mining industry generally.

*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 the last few years. In 2013, Chinese demand represented 64.3% of global demand for seaborne iron ore, 50% of global demand for nickel and 43% of global demand for copper. The percentage of our net operating revenues attributable to sales to customers in China was 40.5% in 2013. 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.

*Our business may be adversely affected by declines in demand for the products our customers produce, including steel (for our iron ore and coal business), stainless steel (for our nickel business) and agricultural commodities (for our fertilizer nutrients business).*

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 73.0% of our 2013 net operating revenues, are used to produce carbon steel. Nickel, which accounted for 8.3% of our 2013 net operating revenues, is used mainly to produce stainless and alloy steels. Demand for steel depends heavily on global economic conditions, but it also depends on a variety of regional and sectorial factors. 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. The demand for fertilizers is affected by prices of agricultural commodities in the international and Brazilian markets, and a sustained decline in the price of one or more agricultural commodities could negatively impact our fertilizer nutrients business.

*The prices we charge, including prices for iron ore, nickel and copper, are subject to volatility.*

Our iron ore prices are based on a variety of pricing options, which generally use spot price indices as a basis for determining the customer price. Our prices for nickel and copper are based on reported prices for these metals on commodity exchanges such as the London Metal Exchange ("LME") and the New York Mercantile Exchange ("NYMEX"). Our prices and revenues for these products are consequently volatile, which may adversely affect our cash flow. Global prices for metals are subject to significant fluctuations and are affected by many factors, including actual and expected global macroeconomic and political conditions, levels of supply and demand, the availability and cost of substitutes, inventory levels, investments by commodity funds and others and actions of participants in the commodity markets.

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The nickel industry has experienced strong supply growth in recent years, which continued to put nickel prices under pressure in 2013. Nickel refining in China, primarily using imported nickel ores and related raw material, increased an estimated 560,000 metric tons from 2006 to 2013. In 2013, estimated Chinese nickel pig iron and ferro-nickel production continued to increase, representing 25% of global nickel output. Other long lead-time nickel projects are also ramping up and will continue to increase the global supply of nickel in the coming years.

In January 2014, the Indonesian government approved a law that restricts the sale and export of unprocessed nickel. Indonesia is currently a major producer of nickel, and as a result of the new law, we expect that the nickel supply on international markets will decline, causing nickel prices to increase. In the event that this measure does not take effect or has an impact different from our expectations, we may need to revise our projections of future prices of nickel.

*We may not be able to adjust production volume in a timely or cost-efficient manner in response to changes in demand.*

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, iron ore pellets or nickel from joint ventures or unrelated parties 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.

Conversely, operating at significant idle 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 high 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.

*Regulatory, political, economic and social conditions in the countries in which we have operations or projects could adversely impact our business and the market price of our securities.*

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 potential renegotiation, nullification or forced modification of existing contracts, expropriation or nationalization of property, foreign exchange controls, changes in local laws, regulations and policies, political instability, bribery, extortion, corruption, civil strife, acts of war, guerilla activities and terrorism. 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.

Actual or potential political or social changes and changes in economic policy may undermine investor confidence, which may hamper investment and thereby reduce economic growth, and otherwise may adversely affect the economic and other conditions under which we operate in ways that could have a materially negative effect on our business.

*We are involved in legal proceedings that could have a material adverse effect on our business in the event of an outcome that is unfavorable to us.*

We are involved in legal proceedings in which adverse parties have claimed substantial amounts. Although we are vigorously contesting them, the outcomes of these proceedings are uncertain and may result in obligations that could materially adversely affect our business and the value of our shares, ADSs and HDSs. For additional information, see *Additional information  Legal proceedings*.

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*Disagreements with local communities in which we operate could adversely impact our business and reputation.*

Disputes with communities where we operate may arise from time to time. Although we contribute to local communities with taxes, royalties, employment and business opportunities and social programs, expectations are complex and involve multiple stakeholders with different and constantly evolving interests. In some instances, our operations and mineral reserves are located on or near lands owned or used by indigenous or aboriginal people or other groups of stakeholders. Some of these indigenous peoples may have rights to review or participate in natural resource management, and we consult and negotiate with them to mitigate the impact of our operations or to obtain access to their lands. 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, local communities and the government. We consult and negotiate with these groups to come to common agreement on land access and how to mitigate the impact on our operations.

Disagreements or disputes with local groups, including indigenous or aboriginal groups, could cause delays or interruptions to our operations, adversely affect our reputation or otherwise hamper our ability to develop our reserves and conduct our operations. Protesters have taken actions to disrupt our operations and projects, and they may continue to do so in the future. Although we engage in active dialogue with all stakeholders and vigorously defend ourselves against illegal acts, future attempts by protesters to harm our operations could adversely affect our business.

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

Mining is subject to government regulation in the form of taxes and royalties, which can have a significant financial impact on our operations. In the countries where we are present, governments may impose new taxes, raise existing taxes and royalty rates, reduce tax exemptions and benefits, request or force renegotiation of tax stabilization agreements or change 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 are also required to meet domestic beneficiation requirements in certain countries in which we operate, such as local processing rules, export taxes or restrictions, or charges on unprocessed ores. The imposition of or increase in such 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.

*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.

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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 and operation of our mines and related logistics infrastructure, which may be subject to fixed expiration dates or periodic review or renewal. While we anticipate that renewals will be given as and when sought, there is no assurance that such renewals will be granted as a matter of course and on a timely basis, 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 might impede our business objectives. 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 is 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 *Regulatory matters*.

*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 and to expand the scope of the minerals we produce. 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 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 the required permits and licenses to build a project, or we may experience delays or higher than expected costs in obtaining 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.

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*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 and related infrastructure, plants, railroads, ports and ships.
- Delays or interruptions in the transportation of our products, including with railroads, ports and ships.
- Tropical diseases, HIV/AIDS and other contagious diseases in regions where some of our development 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.
- 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 of our counterparties to perform their obligations.*

Customers, suppliers, contractors 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. Suppliers are also subject to capacity constraints in times of high demand which may affect their ability to fulfill their commitments.

We currently operate important parts of our pelletizing, bauxite, nickel, coal, copper and steel businesses through joint ventures with other companies. Important parts of our electricity investments and projects are operated through consortia. 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.

In addition, some of our assets may be controlled and managed by joint venture partners that may not fully comply with our standards, controls and procedures, including our health, safety, environment and community standards. Failure by any of our partners to adopt standards, controls and procedures equivalent to ours could lead to higher costs, reduced production or environmental, health and safety incidents or accidents, which could adversely affect our results and reputation.

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

Our operations involve the use, handling, storage, discharge and disposal of hazardous substances into the environment and the use of natural resources, and the mining industry is generally subject to significant risks and hazards, including the potential for fire or explosion, toxic gas leaks, escape of polluting substances or other hazardous materials, rockfall incidents in underground mining operations and incidents involving mobile equipment or machinery. This could occur by accident or by a breach of operating standards, and could result in a significant incident, including damage to or destruction of mineral properties or production facilities, personal injury or death, environmental damage, delays in production, monetary losses and possible legal liability. We have health, safety and environmental standards and risk management systems and processes in place to mitigate the risk of such incidents or accidents. Notwithstanding our standards, policies and controls, our operations remain subject to incidents or accidents that could adversely affect our business or reputation.

*Our business may be adversely affected by environmental regulation, including regulations pertaining to climate change.*

Nearly all aspects of our activities, products, services and projects around the world are subject to environmental, health and safety regulations, which may expose us to increased liability or increased costs. These regulations require us to obtain environmental licenses, permits and authorizations for our operations, and to conduct environmental impact assessments in order to get approval for our projects and permission for initiating construction. Significant changes to existing operations are also subject to these requirements. Difficulties in obtaining permits may lead to construction delays or cost increases. Environmental regulation also imposes standards and controls on activities relating to mineral research, mining, pelletizing activities, railway and marine services, ports, decommissioning, refining, distribution and marketing of our products. Such regulation may give rise to significant costs and liabilities. In addition, community activist groups and other stakeholders may increase demands for socially responsible and environmentally sustainable practices, and their efforts may lead to the creation or revision of government regulations and policies, which could entail significant costs and reduce our profitability. Private litigation relating to these or other matters may adversely affect our financial condition or cause harm to our reputation.

Environmental regulation in many countries in which we operate has become stricter in recent years, and it is possible that more regulation or more aggressive enforcement of existing regulations will adversely affect us by imposing restrictions on our activities and products, creating new requirements for the issuance or renewal of environmental licenses, raising our costs or requiring us to engage in expensive reclamation efforts. For example, changes in Brazilian legislation for the protection of caves have required us to conduct extensive technical studies and to engage in complex discussions with Brazilian environmental regulators, which are continuing. We cannot yet assess the final impact of these regulations on our operations, but it is possible that 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. For more information about Brazilian environmental regulations related to caves, see *Regulatory matters  Environmental regulations*.

National policies and international regulations regarding climate change may affect a number of our businesses in different countries, because we operate worldwide. For example, there is legislation in many countries where we operate that limits greenhouse gas emissions in the mining industry. Regulatory initiatives at the national and international levels that affect our shipping practices could increase our costs or require us to make new capital expenditures.

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*Natural disasters may inflict severe damage to our operations and projects in the countries where we operate and may cause a negative impact in our sales to countries adversely 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 highly uncertain, but we may experience changes in rainfall patterns, water shortages, rising sea levels, increased storm intensity and flooding as a result of climate change, which may adversely affect our operations. On certain occasions in recent years, we have determined that force majeure events have occurred due to severe weather. On December 27, 2013, we declared force majeure under a number of our iron ore sales contracts as a result of the adverse weather conditions in southeastern Brazil, which resulted in the suspension of the mining and transport, creating serious challenges to the operations of our Southeastern System. The force majeure was lifted on January 6, 2014.

*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 result in damage to, or destruction of, properties, facilities and equipment. 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 pollution or certain hazards or 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 could have a material adverse effect on our operations.

*Our reserve estimates may materially differ from mineral quantities that we are actually able to recover; our estimates of mine life may prove inaccurate; 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 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 and engineering and 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 and other factors. For example, fluctuations in the market prices of minerals and metals, reduced recovery rates or increased operating and capital costs due to inflation, exchange rates, changes in regulatory requirements or other factors may render proven and probable reserves uneconomic to exploit and may ultimately result in a restatement of reserves. Such a restatement could affect depreciation and amortization rates and have an adverse effect on our financial performance.

*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.

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*The feasibility of new mineral projects may change over time.*

Once mineral deposits are discovered, it can take a number of 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 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 or 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 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 increased 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 tailing 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.

*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.

*We may face shortages of equipment, services and skilled personnel.*

The mining industry has faced worldwide shortages of mining and construction equipment, spare parts, contractors and other skilled personnel during periods of high demand for minerals and metals and intense development of mining projects. We may experience longer lead times for mining equipment and problems with the quality of contracted engineering, construction and maintenance services. We compete with other mining and extractive sector companies for highly skilled management and staff with relevant industry and technical experience, and we may not be able to attract and retain such people. Shortages during peak periods could negatively impact our operations, resulting in higher production or capital expenditure costs, production interruptions, higher inventory costs, project delays and potentially lower production and revenues.

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

Energy costs are a significant component of our cost of production, representing 10.2% of our total cost of goods sold in 2013. To fulfill our energy needs, we depend on the following sources: oil by-products, which represented 46% of total energy needs in 2013, electricity (25%), coal (7%), natural gas (16%) and other energy sources (6%), using figures converted into tons of oil equivalent ("TOE").

Fuel costs represented 7.5% of our cost of goods sold in 2013. Increases in oil and gas prices adversely affect margins in our logistics services, mining, iron ore pellets, fertilizers and nickel businesses.

Electricity costs represented 2.7% of our total cost of goods sold in 2013. If we are unable to secure reliable access to electricity at acceptable prices, we may be forced to curtail production or may experience higher production costs, either of which would adversely affect our results of operations. We face the risk of energy shortages in the countries where we have operations and projects due to excess demand, lack of infrastructure or weather conditions, such as floods or droughts.

Electricity shortages have occurred throughout the world, and there can be no assurance that growth in power generation capacity in the countries in which we operate will be sufficient to meet future consumption increases. Future shortages, and government efforts to respond to or prevent shortages, may adversely impact the cost or supply of electricity for our operations.

*Price volatility relative to the U.S. dollar of the currencies in which we conduct operations could adversely affect our financial condition and results of operations.*

A substantial portion of our revenues and our debt is denominated in U.S. dollars, and 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 2013, 2012 and 2011, we had foreign exchange losses of US$2.8 billion, US$1.9 billion and US$1.4 billion, respectively. In addition, the price volatility of the Brazilian *real*, the Canadian dollar, the Australian dollar, the Indonesian rupiah and other currencies against the U.S. dollar affect our results since most of our costs of goods sold are denominated in currencies other than the U.S. dollar, principally the *real* (54% in 2013) and the Canadian dollar (14% in 2013), 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.

*The integration between the Company and acquired companies might prove more difficult than anticipated.*

We may not be able to successfully integrate our acquired businesses. We have grown our business in part through acquisitions, and some of our future growth could depend on acquisitions. Integration of acquisition targets might take longer than expected, and the costs associated with integration of acquisition targets might be higher than anticipated. Completed acquisitions could fail to achieve the increased revenues, cost savings or operational benefits that were anticipated at the time of their conception. Acquisitions could lead to the incurrence of substantial costs as a result of, for example, impairment of goodwill, unforeseen liabilities arising from acquired businesses, inability to retain key staff, inconsistencies in standards, controls, procedures and policies between the Company and the acquisition target which could negatively affect our financial condition and results of operations. In addition, management attention could be diverted from ordinary responsibilities to integration issues.

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*Failures in our information technology systems or difficulties in integrating new enterprise resource planning software may interfere with the normal functioning of our business.*

We rely on information technology ("IT") systems for the operation of many of our business processes. Failures in our IT systems, whether caused by accident or malicious acts, may result in the disclosure or theft of sensible information, misappropriation of funds and disruptions to our business operations.

In addition, we are in the process of integrating new enterprise resource planning software into our IT systems. If we are unable to replace, upgrade or modify our IT systems to adapt to this new software in a timely and cost-effective manner, our ability to capture and process financial transactions may be negatively affected. Implementing the software may prove more costly or take longer than expected, result in the loss of data or lead to system malfunctions that interfere with the normal functioning of our business. If we are unable to successfully manage the process of implementing the new software, our results of operations may be adversely affected.

**Risks relating to our corporate structure**

*Our controlling shareholder has significant influence over Vale, and the Brazilian government has certain veto rights.*

As of February 28, 2014, Valepar S.A. ("Valepar") owned 52.7% of our outstanding common stock and 32.4% of our total outstanding capital. As a result of its share ownership, Valepar can elect the majority of our board of directors and control the outcome of some actions that require shareholder approval. For a description of our ownership structure and of the Valepar shareholders' agreement, see *Share ownership and trading Major shareholders*.

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 preferred shares*.

*Our governance and compliance processes may fail to prevent regulatory penalties and reputational harm.*

We operate in a global environment, and our activities straddle multiple jurisdictions and complex regulatory frameworks with increased enforcement activities worldwide. Our governance and compliance processes, which include the review of internal control over financial reporting, may not prevent future breaches of legal, accounting or governance standards. We may be subject to breaches of our Code of Ethics and Conduct 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 fines, loss of operating licenses and reputational harm.

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*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. The Company is 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 investors. It might not be possible for investors 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 foreign judgment will be enforceable in the courts of Brazil without a re-examination of the merits only if previously confirmed by the Brazilian Superior Court of Justice (*Superior Tribunal de Justiça*), and confirmation will only be granted if the judgment: (a) fulfills all formalities required for its enforceability under the laws of the country where it was issued; (b) was issued by a competent court after due service of process on the defendant, as required under applicable law; (c) is not subject to appeal; (d) was authenticated by a Brazilian consulate in the country in which it was issued and is accompanied by a sworn translation into the Portuguese language; and (e) 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 or HDR holders exchange ADSs or HDSs, respectively, for the underlying shares, they risk losing the ability to remit foreign currency abroad.*

The custodian for the shares underlying our ADSs and HDSs maintains a registration with the Central Bank of Brazil entitling it to remit U.S. dollars outside Brazil for payments of dividends and other distributions relating to the shares underlying our ADSs and HDSs or upon the disposition of the underlying shares. If an ADR holder or HDR holder exchanges its ADSs or HDSs 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 or HDR 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 Resolution No. 2,689 of the National Monetary Council ("CMN"), which permits qualifying institutional foreign investors to buy and sell securities on the BM&FBOVESPA. For more information regarding these exchange controls, see *Additional information  Exchange controls and other limitations affecting security holders*. If an ADR holder or HDR 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 or HDR holders, the disposition of the underlying shares or the repatriation of the proceeds from disposition could be imposed in the future.

*ADR holders and HDR holders may be unable to exercise preemptive rights relating to the shares underlying their ADSs and HDSs.*

The ability of ADR holders and HDR 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 or the Companies Ordinance in Hong Kong) 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, or that any document offering preemptive rights be registered as a prospectus, as is the case in Hong Kong. We are not obligated to extend the offer of preemptive rights to holders of ADRs or HDRs, 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.

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

ADR holders and HDR 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 and HDR 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 or HDRs 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 us 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. Similarly, we have been granted waivers and exemptions from certain requirements of the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited ("HKEx Listing Rules"), the Codes on Takeovers and Mergers and Share Repurchases and the Securities and Futures Ordinance of Hong Kong that are generally applicable to issuers listed in Hong Kong.

## PRESENTATION OF FINANCIAL INFORMATION

Our financial statements as of and for each of the years ended in December 31, 2013, 2012 and 2011 contained in this annual report have been presented in U.S. Dollars and prepared in accordance with International Financial Reporting Standards ("IFRS"), as issued by the International Accounting Standards Board ("IASB").

We have discontinued the preparation of financial statements in accordance with generally accepted accounting principles in the United States ("U.S. GAAP"). We have adopted IFRS, as issued by the IASB, as the basis for the preparation and presentation of our financial statements and reporting to the SEC beginning with our financial statements as of and for the year ending December 31, 2013 presented in this annual report. This annual report and future reports filed with the SEC will only present financial information prepared in accordance with IFRS.

We first adopted IFRS, as issued by the IASB, for our financial statements for the year ended December 31, 2010, which we published and filed with the CVM. Our transition date from Brazilian GAAP to IFRS was January 1, 2009, and we used certain mandatory or elective exceptions under IFRS 1 in those financial statements. For a reconciliation of our financial statements in accordance with IFRS from U.S. GAAP, see Note 33 to our consolidated financial statements.

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## SELECTED FINANCIAL DATA

The tables below present selected consolidated financial information as of and for the periods 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, | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| | (US$ million) | | | | |
| Net operating revenues | 24,771 | 46,424 | 60,075 | 46,553 | 46,767 |
| Cost of products and services | (15,035) | (19,829) | (24,528) | (25,390) | (24,245) |
| Selling, general and administrative expenses | (1,064) | (1,663) | (2,271) | (2,172) | (1,302) |
| Research and development | (976) | (876) | (1,671) | (1,465) | (801) |
| Other operating expenses, net | (1,553) | (2,214) | (2,775) | (3,588) | (2,843) |
| Impairment of non-current assets | | | | (4,023) | (2,298) |
| Gain (loss) on measurement or sales of non-current assets | | | 1,494 | (506) | (215) |
| Operating income | 6,143 | 21,842 | 30,324 | 9,409 | 15,063 |
| Non-operating income (expenses): | | | | | |
| Financial income (expenses), net | 874 | (1,533) | (3,549) | (4,022) | (8,332) |
| Equity results from associates and joint controlled entities | 440 | 983 | 1,138 | 645 | 469 |
| Results on sale of investments from associates and joint controlled entities | 17 | | | | 41 |
| Impairment on investments | | | | (1,941) | |
| Income before income taxes | 7,474 | 21,292 | 27,913 | 4,091 | 7,241 |
| Income taxes | (2,080) | (3,712) | (5,265) | 1,174 | (6,833) |
| Income from continuing operations | 5,394 | 17,580 | 22,648 | 5,265 | 408 |
| Income (loss) attributable to non-controlling interests | 107 | 190 | (233) | (257) | (178) |
| Net income attributable to Company's shareholders, from continuing operations | 5,287 | 17,390 | 22,881 | 5,522 | 586 |
| Loss from discontinued operations, net of tax | (6) | (133) | (86) | (68) | (2) |
| Net income attributable to Company's shareholders | 5,281 | 17,257 | 22,795 | 5,454 | 584 |
| Income (loss) attributable to non-controlling interests | 107 | 190 | (233) | (257) | (178) |
| Net income | 5,388 | 17,447 | 22,562 | 5,197 | 406 |
| Total cash paid to shareholders(1) | 2,724 | 3,000 | 9,000 | 6,000 | 4,500 |

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

**Earnings per share**

| | For the year ended December 31, | | | | |
|---|---|---|---|---|---|
| | **2009** | **2010** | **2011** | **2012** | **2013** |
| | **(US$, except as noted)** | | | | |
| Earnings per share: | | | | | |
| Per common share | 0.98 | 3.25 | 4.34 | 1.06 | 0.11 |
| Per preferred share | 0.98 | 3.25 | 4.34 | 1.06 | 0.11 |
| Weighted average number of shares outstanding (in thousands)(1)(2): | | | | | |
| Common shares | 3,181,706 | 3,210,023 | 3,197,063 | 3,172,179 | 3,185,653 |
| Preferred shares | 2,030,700 | 2,035,783 | 1,984,030 | 1,933,491 | 1,967,722 |
| Treasury common shares underlying convertible notes | 74,998 | 18,416 | 18,416 | | |
| Treasury preferred shares underlying convertible notes | 77,580 | 47,285 | 47,285 | | |
| Total | 5,364,984 | 5,311,507 | 5,246,794 | 5,105,670 | 5,153,375 |
| Distributions to shareholders per share(3): | | | | | |
| Expressed in US$ | 0.53 | 0.57 | 1.74 | 1.17 | 0.87 |
| Expressed in R$ | 1.01 | 0.98 | 2.89 | 2.26 | 1.81 |

(1) Each common ADS represents one common share and each preferred ADS represents one preferred share.

(2) Changes in the number of shares outstanding reflect share repurchase programs conducted from May 2011 to November 2011. For more information see *Share ownership and trading Purchases of equity securities by the issuer and affiliated purchasers*.

(3) 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.*

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**Balance sheet data**

| | At December 31, | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| | (US$ million) | | | | |
| Current assets | 20,459 | 31,559 | 21,538 | 22,069 | 20,611 |
| Property, plant and equipment, net and intangible assets | 69,042 | 86,115 | 91,863 | 94,093 | 88,536 |
| Investments in affiliated companies and joint ventures and other investments | 4,446 | 4,394 | 8,013 | 6,384 | 3,584 |
| Other assets | 5,527 | 4,559 | 5,502 | 8,031 | 11,866 |
| Total assets | 99,474 | 126,627 | 126,916 | 130,577 | 124,597 |
| Current liabilities | 9,208 | 17,987 | 11,093 | 12,402 | 9,164 |
| Liabilities directly associated with non-current assets held for sale and discontinued operations | | | | 169 | 448 |
| Long-term liabilities(1) | 12,764 | 17,214 | 16,470 | 16,380 | 22,379 |
| Long-term debt(2) | 19,902 | 21,591 | 21,538 | 26,799 | 27,670 |
| Total liabilities | 41,874 | 56,792 | 49,101 | 55,750 | 59,661 |
| Results from operations with non-controlling shareholders | (98) | 1,413 | 7 | (400) | (400) |
| Shareholders' equity: | | | | | |
| Capital stock | 43,869 | 45,266 | 60,578 | 60,578 | 60,578 |
| Additional paid-in capital | (98) | 1,413 | 7 | (552) | (552) |
| Mandatorily convertible notes common ADSs | 1,350 | 236 | 191 | | |
| Mandatorily convertible notes preferred ADSs | 1,048 | 528 | 422 | | |
| Retained earnings and revenue reserves | 8,826 | 19,866 | 14,902 | 13,213 | 3,299 |
| Total Company shareholders' equity | 54,995 | 67,309 | 76,100 | 73,239 | 63,325 |
| Noncontrolling interests | 2,605 | 2,526 | 1,715 | 1,588 | 1,611 |
| Total shareholders' equity | 57,600 | 69,835 | 77,815 | 74,827 | 64,936 |
| Total liabilities and shareholders' equity | 99,474 | 126,627 | 126,916 | 130,577 | 124,597 |

(1) Excludes long-term debt.

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

In 2013, we started to account for our employment benefits according to the revised IAS 19 Employee benefits ("IAS 19R"). In accordance with its transition provisions, we applied this standard retrospectively as of and for the years ended December 31, 2012 and 2011. For further details on the effects of retroactive application of IAS 19R, see Note 6 to our consolidated financial statements. We have not restated our

selected consolidated financial information set forth above as of and for the years ended December 31, 2010 and 2009, because we do not consider the impact of IAS 19R material for those periods.

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## I. INFORMATION ON THE COMPANY

### BUSINESS OVERVIEW

**Summary**

We are one of the largest metals and mining companies in the world and the largest in the Americas, based on market capitalization. We are the world's largest producer of iron ore and iron ore pellets and the world's second-largest producer of nickel. We also produce manganese ore, ferroalloys, coal, copper, platinum group metals ("PGMs"), gold, silver, cobalt and potash, phosphates and other fertilizer nutrients. To support our growth strategy, we are engaged in mineral exploration efforts in 11 countries around the globe. 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 portfolio of maritime freight assets, floating transfer stations and a distribution center to support the distribution of iron ore worldwide. Directly and through affiliates and joint ventures, we also have investments in energy and steel businesses.

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

| | Year ended December 31, | | | | | |
|---|---|---|---|---|---|---|
| | 2011 | | 2012 | | 2013 | |
| | US$ million | % of total | US$ million | % of total | US$ million | % of total |
| Bulk materials: | | | | | | |
| Iron ore | 36,416 | 60.6% | 26,931 | 57.9% | 28,137 | 60.2% |
| Iron ore pellets | 7,938 | 13.2 | 6,560 | 14.1 | 6,000 | 12.8 |
| Manganese and ferroalloys | 676 | 1.1 | 543 | 1.2 | 523 | 1.1 |
| Coal | 1,058 | 1.8 | 1,092 | 2.3 | 1,010 | 2.2 |
| Other ferrous products and services | 585 | 1.0 | 246 | 0.5 | 132 | 0.3 |
| Subtotal bulk materials | 46,673 | 77.7 | 35,372 | 76.0 | 35,802 | 76.6 |
| Base metals: | | | | | | |
| Nickel and other products(1) | 8,118 | 13.5 | 5,975 | 12.8 | 5,839 | 12.5 |
| Copper(2) | 1,103 | 1.8 | 1,156 | 2.5 | 1,447 | 3.1 |
| Subtotal base metals | 9,221 | 15.3 | 7,131 | 15.3 | 7,286 | 15.6 |
| Fertilizer nutrients | 3,322 | 5.5 | 3,570 | 7.7 | 2,814 | 6.0 |
| Other(3) | 859 | 1.4 | 480 | 1.0 | 865 | 1.8 |
| Total net operating revenues | 60,075 | 100.0% | 46,553 | 100.0% | 46,767 | 100.0% |

(1) Includes nickel co-products and by-products (copper, precious metals, cobalt and others).

(2) Does not include copper produced as a nickel co-product.

(3) Includes pig iron and energy.

Bulk materials:

- *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. The Northern and the Southeastern Systems are fully integrated, consisting of mines, railroads and a maritime terminal and a port. The Southern System consists of three mining sites and two maritime terminals. We operate 10 pellet plants in Brazil and two in Oman. The operations of three of our pellet plants in Brazil have been suspended since the fourth quarter of 2012 in response to market conditions. We also have a 50% stake in a joint venture that owns three integrated pellet plants in Brazil, and we have 25% stakes in two pellet companies in China.

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- *Manganese and ferroalloys*. We conduct our manganese mining operations through subsidiaries in Brazil, and we produce several types of manganese ferroalloys through a wholly-owned subsidiary in Brazil.

- *Coal*. We produce metallurgical and thermal coal through Vale Moçambique, S.A. ("Vale Moçambique"), which operates assets in Mozambique, and Rio Doce Australia Pty Ltd ("Vale Australia"), which operates coal assets in Australia through wholly-owned subsidiaries and unincorporated joint ventures. In Mozambique, we are ramping up operations in Moatize, which includes both metallurgical and thermal coal. We also have minority interests in Chinese coal and coke producers.

Base metals:

- *Nickel*. Our principal nickel mines and processing operations are conducted by our wholly-owned subsidiary Vale Canada Limited ("Vale Canada"), which has mining operations in Canada and Indonesia. We also own and operate, or have interests in, nickel refining facilities in the United Kingdom, Japan, Taiwan, South Korea and China. We are currently ramping up our operations in New Caledonia. At the end of 2013, we resumed the ramp-up of our nickel operations in Onça Puma, Brazil.

- *Copper*. In Brazil, we produce copper concentrates at Sossego and Salobo, in Carajás, in the Brazilian state of Pará. Salobo operations are ramping up. In Canada, we produce copper concentrates, copper anodes and copper cathodes in conjunction with our nickel mining operations at Sudbury and Voisey's Bay. In Zambia, our joint venture produces copper concentrates at Lubambe, located in the Zambian Copperbelt.

- *Cobalt, PGMs and other precious metals*. We produce cobalt as a by-product of our nickel mining and processing operations in Canada and refine the majority of it at our Port Colborne facilities, in the Province of Ontario, Canada. We also produce cobalt as a by-product of our nickel operations in New Caledonia, which we are currently ramping up. We produce PGM as by-products of our nickel mining and processing operations in Canada. The PGMs are concentrated at our Port Colborne facilities and refined at our precious metals refinery in Acton, England. We produce gold and silver as by-products of our nickel mining and processing operations in Canada, and gold as a by-product of our copper mining in Brazil. Some of the precious metals from our Canadian operations are upgraded at our Port Colborne facilities, and all such precious metals are refined by unrelated parties in Canada and other countries.

Fertilizer nutrients:

- We produce potash in Brazil, with operations in Rosario do Catete, in the state of Sergipe. Our main phosphate operations are conducted by our subsidiary Vale Fertilizantes S.A. ("Vale Fertilizantes"), which holds most of our fertilizer assets in Brazil and is the largest Brazilian producer of phosphate rock, phosphate and nitrogen fertilizers. We also have operations in Bayóvar, a phosphate rock mine in Peru.

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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. We are constructing a world-class logistics infrastructure to support our operations in Central and Eastern Africa. We own and charter dry bulk vessels to transport the products that we sell on a cost and freight ("CFR") basis to customers.

**Business strategy**

Our mission is to transform natural resources into prosperity and sustainable development. Our vision is to be the number one global natural resources company in creating long-term value through excellence and passion for people and the planet. We are committed to investing only in world-class assets, with long life, low cost, expandability and high quality output, capable of creating value through the cycles. A lean management organization, with teamwork and accountability, excellence in project execution and firm commitment to transparency and shareholder value creation are principles of paramount importance that guide us towards the achievement of our goals. Health and safety, investment in human capital, a positive work environment and sustainability are also critical to our long-term competitiveness.

We aim to maintain our leadership position in the global iron ore market and to grow through world-class assets while exercising disciplined capital management and maintaining a low cost structure. Iron ore and nickel will continue to be our main businesses while we work to maximize the value of our copper, coking coal and fertilizer nutrients businesses. To enhance our competitiveness, we will continue to invest in our railroads and our global distribution network. We seek opportunities to make strategic partnerships and complement our portfolio through acquisitions, while focusing on disciplined capital management. We have also disposed of assets that we have determined to be non-strategic or in order to optimize the structure of our business portfolio. The divestiture of assets improves capital allocation and unlocks funds to finance the execution of top priority projects. The preservation of our credit ratings is one of our basic commitments. Below are the highlights of our major business strategies.

***Maintaining our leadership position in the global iron ore market***

We continue to consolidate our leadership in the global iron ore market. In 2013, we had an estimated market share of 21.9% of the total volume traded in the seaborne market, slightly below the previous year. We are committed to maintaining our leadership position in the global iron ore market, by focusing our product line to capture industry trends, increasing our production capacity in line with demand growth, 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 achieve this goal.

***Enhancing our logistics capacity to support our bulk materials business***

We believe that the quality of our railway assets and extensive experience as a railroad and port operator position us as a leader in the logistics business in Brazil. We have been expanding the capacity of our railroads primarily to meet the needs of our iron ore business.

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To support our commercial strategy for our iron ore business, we are building a global distribution network. We operate a distribution center in Oman and two floating transfer stations ("FTS") in the Philippines, and we continue to invest in a fleet of Valemax vessels primarily dedicated to transporting iron ore from Brazil to Asia on a shuttle basis. We are also investing in the development of a distribution center in Malaysia in order to enhance the competitiveness of our iron ore business in the region.

In order to position ourselves for the future expansion of our coal production in Mozambique and leverage our presence in Africa, we are currently expanding railroad capacity by rehabilitating the existing network and building new railroad tracks to develop the logistics corridor from our mine to a new port to be built at Nacala-à-Velha.

***Maximization of value in the nickel and copper businesses***

We are one of the world's largest nickel producers, with large-scale, long-life and low-cost operations, a substantial resource base, diversified mining operations producing nickel from nickel sulfides and laterites and advanced technology. We have refineries in North America, South America, Europe and Asia, which produce an array of products for use in most nickel applications. We are a leading producer of high-quality nickel products for non-stainless steel applications, such as plating, alloy steels, high nickel alloys and batteries, which represented 63% of our nickel sales in 2013. Our long-term goal is to strengthen our leadership in the nickel business. We continue to optimize our operational flowsheet and to review our asset utilization aiming to increase cost efficiency and improve returns.

The growth of our copper business will allow us to leverage the processing plants in our Sossego and Salobo operations by using existing facilities and minimizing capital expenditures. We operate the Sossego copper mine and are ramping up our copper operations at Salobo, both located in the Carajás region. These copper mines benefit from our infrastructure facilities serving the Northern System. The gold we produce at Sossego and Salobo increases the total aggregated value of those operations. We are also ramping up our copper operations at Lubambe, in Zambia, through a joint venture. We also recover copper in conjunction with our nickel operations, principally at Sudbury and Voisey's Bay, in Canada.

***Developing the coal business***

We have coal operations in Moatize (Mozambique) and Australia, and we hold minority interests in two joint ventures in China. We intend to continue pursuing organic growth in the metallurgical coal business mainly through the expansion of the Moatize operations in Mozambique.

***Maintaining growth options in fertilizer nutrients business***

We have potash and phosphate rock operations as well as potential investments in greenfield and brownfield projects that we believe will allow us to benefit from certain demographic trends: the growing world population, an increase in per capita income in emerging economies, higher global consumption of proteins and fertilizer-driven agricultural expansion in Brazil. We operate phosphate assets and a potash mine in Brazil (Taquari-Vassouras) and a phosphate rock operation in Peru (Bayóvar). Our portfolio also includes potash and phosphate projects and mineral exploration initiatives.

***Development of our resource base***

We are taking advantage of our global presence to develop mineral exploration initiatives. We conduct brownfield exploration to maximize results from existing mining areas and to support both projects and operations. We conduct our greenfield exploration activities in 11 countries, with Brazil, Peru, Chile, Australia and Indonesia representing 82% of our expenditures budgeted for 2014. In particular, we seek to identify opportunities and develop deposits with the potential for large scale production at low cost. Our exploration activities include iron ore, nickel, copper, coal, potash and phosphates.

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***Optimizing our energy matrix***

As a large consumer of electricity, we have invested in power generation projects to support our operations and to reduce our exposure to the volatility of energy prices and regulatory uncertainties. Accordingly, we have developed hydroelectric power generation plants in Brazil, Canada and Indonesia, and we currently generate 59% of our worldwide electricity needs from our own plants. We are seeking to develop a cleaner energy matrix by investing to develop clean energy sources such as biofuels and focusing on reducing our carbon footprint.

***Integrating sustainability into our business***

We are committed to integrating sustainability considerations into our business strategy, as we cannot grow without taking into account the physical limits of our planet or the well-being of communities in which we operate. Since 2013, we have incorporated environmental and social projects directly into our strategic planning, moving away from a stand-alone investment model. We practice sustainable mining by dedicating resources to education and research on applying technologies to use natural resources efficiently. In addition, we actively support an open dialogue with our main stakeholders (governments, communities, customers, suppliers, employees and others), because we recognize that only by acting together can we achieve sustainable growth and contribute to social welfare.

**Significant changes in our business**

We summarize below major events related to our organic growth, divestitures, acquisitions and other significant developments in our business since the beginning of 2013.

***Organic growth***

We have an extensive program of investments in the organic growth of our businesses. Our main investment projects are summarized under *Capital expenditures*. The most significant projects that have come on stream since the beginning of 2013 are summarized below:

*Carajás plant 2 (formerly known as Carajás Additional 40 Mtpy).* In the second half of 2013, we completed the construction of an iron ore dry processing plant in Carajás, in the Brazilian state of Pará, which is expected to reduce our operating costs and increase our productivity. The estimated nominal capacity of this project is 40 Mtpy.

*Carajás CLN 150Mtpy.* In the second half of 2013, we completed the Carajás CLN 150 Mtpy project, which resulted in the increase of the Northern System's railway and port capacity. The project included the construction of a fourth pier at the Ponta da Madeira maritime terminal, located in the Brazilian state of Maranhão, increasing the terminal's capacity to 150 Mtpy. This project raised EFC's estimated nominal logistics capacity to 128 Mtpy.

*Conceição Itabiritos.* In the second half of 2013, we also completed the construction of a concentration plant in the Southeastern System, in the Brazilian state of Minas Gerais. The estimated additional nominal capacity of the project is 12 Mtpy of pellet feed.

*Long Harbour.* In the second half of 2013, we completed the construction of our hydrometallurgical facility in Long Harbour, in the province of Newfoundland and Labrador, Canada. The refinery has an estimated nominal capacity of 50,000 tpy of finished nickel with associated copper and cobalt co-product streams, without additional capacity. We have initiated commissioning activities and expect to commence production in the second quarter of 2014.

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*Totten.* In the second half of 2013, we also concluded construction of our nickel-copper mine in Sudbury, Ontario, Canada. The project has an estimated nominal capacity of 8,000 tpy nickel and 10,000 tpy of copper.

***Dispositions and asset sales***

We are always seeking to optimize the structure of our portfolio of businesses in order to achieve the most efficient allocation of capital. To that end, we dispose of assets that we have determined to be non-strategic. We summarize below our most significant dispositions and asset sales since the beginning of 2013.

*Sale of gold streams from Salobo and Sudbury mines* In February 2013, we sold to Silver Wheaton Corp. and Silver Wheaton (Caymans) Ltd. (together, "Silver Wheaton") 25% of the gold produced as a by-product at our Salobo copper mine, in Brazil, for the life of that mine, and 70% of the gold produced as a by-product at our Sudbury nickel-copper mines, in Canada, for 20 years. We received an initial cash payment of US$1.9 billion and 10 million warrants exercisable into Silver Wheaton shares, with a strike price of US$65.0 and a 10-year term, and ongoing payments of the lesser of US$400 (which in the case of Salobo is subject to a 1% annual inflation adjustment) and the prevailing market price, for each ounce of gold that we deliver under the agreement.

*Sale of interests in Hydro* In November 2013, we sold our entire 22% interest in Norsk Hydro ASA ("Hydro"), a major aluminum producer listed on the Oslo Stock Exchange and the London Stock Exchange, in an offering that generated gross cash proceeds of US$1.811 billion. We originally acquired the interest in 2011, as part of the consideration for transferring a substantial part of our aluminum business in Brazil to Hydro.

*Sale of stake in oil and gas concessions* In November 2013, we entered into an agreement to sell our 20% stake in onshore concessions BT-PN-2 and BT-PN-3 in the Parnaíba Basin, Brazil to a subsidiary of GDF Suez. The transaction amounts to US$8 million in cash plus potential proceeds of up to US$22 million, subject to the purchaser's final investment decision to develop and produce under these concessions. The conclusion of this sale will relieve us from committed capital expenditures of approximately US$16 million until June of 2014. The closing of this transaction is subject to customary conditions precedent and regulatory approvals.

*Sale of Tres Valles* In December 2013, we concluded the sale of Sociedad Contractual Minera Tres Valles ("Tres Valles"), a copper mine business in the Coquimbo region in Chile, to Inversiones Porto San Giorgio S.A, controlled by Vecchiola S.A, for US$25 million. The transaction includes the sale of all of our 90%-equity interest in Tres Valles and other mineral rights we held in the Coquimbo region.

*Sale of Log-in* In December 2013, we sold our entire 31.3% stake in Log-in Logística Intermodal S.A. ("Log-in") through an auction on the BM&FBOVESPA. We received a total of US$94 million from this sale.

*Sale of Fosbrasil* In December 2013, we agreed to sell our entire 44.25% stake in Fosbrasil, a company that produces purified phosphoric acid in Cajati, in the Brazilian state of São Paulo, to Israel Chemicals Ltd ("ICL") for US$45 million. The conclusion of this transaction is subject to customary conditions precedent and regulatory approvals.

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*Sale of stakes in VLI* In 2013, we agreed to sell an aggregate of 62.4% of our wholly-owned subsidiary VLI S.A. ("VLI"). In September 2013, we agreed to transfer 20% of the total share capital to Mitsui & Co., Ltd. ("Mitsui"), for R$1.5 billion, and 15.9% to the investment fund of a Brazilian employee benefits fund called Fundo de Garantia por Tempo de Serviço FGTS ("FI-FGTS"), for R$1.2 billion. All of the cash proceeds from the sale to FI-FGTS and R$800.0 million of the proceeds from Mitsui will consist of a cash contribution to VLI in consideration of the issue of new shares to Mitsui and FI-FGTS. The cash contribution to VLI will be used to finance part of VLI's investment plan. We will receive the remaining R$709.0 million directly from Mitsui in consideration of the transfer of VLI shares held by Vale. In December 2013, we entered into an agreement with an investment fund managed by Brookfield Asset Management ("Brookfield") for the sale of an additional 26.5% stake in VLI, for R$2.0 billion, which we will receive directly from Brookfield in consideration of the transfer of VLI shares held by Vale. Each of these transactions is subject to conditions precedent, including, in the case of the transaction with Brookfield, approval by the antitrust authorities. On March 20, 2014, the antitrust authorities approved the transactions with Mitsui and FI-FGTS. Upon completion of these transactions, we will hold 37.6% of VLI's total share capital, and will enter into a shareholders' agreement with Mitsui, FI-FGTS and Brookfield.

***Acquisitions***

*Completion of the Belvedere acquisition* In February 2013, we concluded the acquisition from a subsidiary of Aquila Resources Limited ("Aquila") of the remaining 24.5% stake that we did not own in the Belvedere underground coal project ("Belvedere") in Queensland, Australia. The price of A$150 million (US$156million) was the fair market value determined by an independent expert engaged by Vale and Aquila. Belvedere is still in an early stage of development and, consequently, its implementation is subject to approval by our Board of Directors. According to our preliminary estimates, Belvedere has the potential to reach a production capacity up to 7.0 million metric tons per year of mainly coking coal.

*Increased stake in Capim Branco I and II hydroelectric power plants* In March 2013, we acquired an additional 12.47% stake in Capim Branco I and II hydroelectric power plants from Suzano Papel e Celulose S.A. for US$112 million. Through this acquisition, our stake in Capim Branco I and II increased to 60.89%, which stake gives us the right to receive around 1,524 gigawatt hours of energy per year until the end of the concession in 2036.

***Restructuring our investments in power generation***

In December 2013, we entered into several agreements with CEMIG Geração e Transmissão S.A. ("CEMIG GT") to: (i) sell 49% of our 9% 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, to CEMIG GT, for approximately R$206 million; and (ii) create two distinct joint ventures, which will hold the power generation assets and projects described below:

The first joint venture is Aliança Norte Energia Participações S.A. ("Aliança Norte Energia"), which will be 51% owned by us and 49% by CEMIG GT. We will convey our current direct 9.0% interest in Norte Energia to Aliança Norte Energia. As a result, our interest in the Belo Monte project will be reduced to 4.59%, and we are seeking to reduce our guarantee of the financing for the Belo Monte project to the corresponding percentage.

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The second joint venture is Aliança Geração de Energia S.A. ("Aliança Geração"). We will own 55% of Aliança Geração, which will hold our and CEMIG GT's interests in the following hydroelectric power plants: Porto Estrela, Igarapava, Funil, Capim Branco I e II, Aimorés and Candonga. These plants have an aggregate attributable installed capacity of 1,158 MW and assured energy of 652 average MW. We will enter into long-term contracts with Aliança Geração in order to maintain the same amount of energy supplied to our operations.

These transactions are subject to regulatory approvals and other conditions precedent. The final amounts of these transactions are subject to certain adjustments in accordance with the terms and conditions established in the investment agreements.

***Suspension of the Rio Colorado project in Argentina***

In March 2013, we suspended the implementation of the Rio Colorado project in Argentina, because the circumstances of the project under current conditions would not enable results in line with our commitment to discipline in capital allocation and value creation. We have been and will keep honoring our commitments related to the concessions and reviewing alternatives to enhance the prospects for the project, and we will subsequently evaluate whether to resume it. In 2013, we recognized an impairment on our potash assets related to the Rio Colorado project. For more information see Note 16 to our consolidated financial statements.

***Obtaining environmental licenses for S11D and CLN S11D projects***

In May 2013, we received the environmental license to construct a 101 km rail spur that will connect the Carajás S11D project to the Carajás railroad ("EFC"), which is part of the CLN S11D project. In July 2013, we obtained the installation license for our Carajás S11D iron ore project, which authorizes construction of the plant and development of the mine. The S11D project consists of development of a mine, processing plant, railway and a port, with an estimated nominal capacity of 90 Mtpy of iron ore. The CLN S11D project is expected to increase EFC's estimated nominal logistics capacity to approximately 230 Mtpy.

***Participation in the REFIS***

In November 2013, we elected to participate in the federal tax settlement program ("REFIS") for payment of Brazilian corporate income tax and social contribution on the net income of our non-Brazilian subsidiaries and affiliates from 2003 to 2012.

Under the program, we paid US$2.6 billion in 2013, including an upfront payment and an initial installment, and the remaining US$7.0 billion to be paid in 178 further monthly installments, accruing interest based on the Central Bank of Brazil's overnight interest rate ("SELIC"). Our participation in the REFIS resulted in a substantial reduction in the amounts in dispute and is consistent with our goal of eliminating uncertainties and focusing on our core businesses, while preserving potential benefits from legal challenges to the tax regime for foreign subsidiaries. Our participation in the REFIS had a substantial effect on our 2013 financial performance. For more information about the REFIS, see *Legal proceedings  Litigation on Brazilian taxation of foreign subsidiaries*.

***Resumption of Onça Puma operations***

At the end of 2013, we resumed our nickel operations at Onça Puma, which had been suspended since June 2012 as a result of damages to the facility's two furnaces. We rebuilt one of the furnaces, and the nominal capacity of Onça Puma with only one furnace operating will be approximately 25,000 tpy.

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## LINES OF BUSINESS

Our principal lines of business consist of mining and related logistics. We also have energy assets to supply part of our consumption. This section presents information about operations, production, sales and competition and is organized as follows.

**1. Bulk materials**

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 Coal
- 1.2.1 Operations
- 1.2.2 Production
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1.3 Manganese ore and ferroalloys
- 1.3.1 Manganese ore operations and production
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**2. Base metals**

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- 2.1.1 Operations
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- 2.2.3 Customers and sales
- 2.2.4 Competition

2.3 PGMs and other precious metals

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**3. Fertilizer nutrients**

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**5. Other investments**

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## 1. Bulk materials

Our bulk materials business includes iron ore mining, iron ore pellet production, coal 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, through our wholly-owned subsidiary Mineração Corumbaense Reunida S.A. ("MCR") and through our subsidiary 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 capabilities. We also conduct mining operations in the Midwestern System and through Samarco Mineração S.A. ("Samarco"), a joint venture with BHP Billiton plc in which we have a 50% equity stake. We conduct each of our iron ore operations in Brazil under concessions from the federal government granted for an indefinite period. For more information about these concessions, see *Regulatory matters Mining rights and regulation of mining activities*.

| Company/Mining System | Location | Description/History | Mineralization | Operations | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| Vale | | | | | | |
| *Northern System* | Carajás, state of Pará | Open-pit mines and ore-processing plants. Divided into Serra Norte, Serra Sul and Serra Leste (northern, southern and eastern ranges). Since 1985, we have been conducting mining activities in the northern range, which is divided into three main mining areas (N4W, N4E and N5). A new beneficiation plant started up in the last quarter 2013. | High grade hematite (66.7% on average). | Open-pit mining operations. Beneficiation process consists simply of sizing operations, including screening, hydrocycloning, crushing and filtration. Output from the beneficiation process consists of sinter feed, pellet feed and lump ore. | Supplied through the national electricity grid. Acquired from regional utility companies. | EFC railroad transports the iron ore to the Ponta da Madeira maritime terminal in the state of Maranhão. |
| *Southeastern System* | Iron Quadrangle, state of Minas Gerais | Three sites: Itabira (two mines, with three major beneficiation plants), Minas Centrais (three mines, with three major beneficiation plants and one secondary plant) and Mariana (three mines, with four major beneficiation plants). | Ore reserves with high ratios of itabirite ore relative to hematite ore. Itabirite ore has iron grade of 35-60% and requires concentration to achieve shipping grade. | 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 sites. | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | EFVM railroad connects these mines to the Tubarão port. |

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| Company/Mining System | Location | Description/History | Mineralization | Operations | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| *Southern System* | Iron Quadrangle, state of Minas Gerais | Three major sites: Minas Itabirito (four mines, three major beneficiation plants and three secondary beneficiation plants); Vargem Grande (three mines and two major beneficiation plants); and Paraopeba (four mines and four beneficiation plants). | Ore reserves with high ratios of itabirite ore relative to hematite ore. Itabirite ore has iron grade of 35-60% and requires concentration to achieve shipping grade. | 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 sites. | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | MRS, an affiliate railway company, transports our iron ore products from the mines to our Guaíba Island and Itaguaí maritime terminals in the state of Rio de Janeiro. |
| *Midwestern System*(1) | State of Mato Grosso do Sul | Comprised of the Urucum and Corumbá mines. Open-pit mining operations. | Urucum and Corumbá ore reserves comprised by hematite ore, which generates lump ore predominantly. | Open-pit mining operations. The beneficiation process for the run of mine consists of standard crushing and classification steps, producing lump and fines. | Supplied through the national electricity grid. Acquired from regional utility companies. | Products delivered to customers through barges traveling along the Paraguay and Paraná rivers. |
| Samarco | Iron Quadrangle, state of Minas Gerais | Integrated system comprised of two mines, two beneficiation plants, two pipelines, three pellet plants and a port. | Itabirite type. | Open-pit mining operations. The two beneficiation plants, located at the site, process the run-of-mine by means of standard crushing, milling and concentration steps, producing pellet feed and sinter feed. | Supplied through the national electricity grid. Acquired from regional utility companies. | Samarco mines supply the Samarco pellet plants using two pipelines extending approximately 400 kilometers. These pipelines transport the iron ore from the beneficiation plants to the pelletizing plants, and from the pelletizing plants to the port in the state of Espírito Santo. |

(1) Part of our operations in the Midwestern System is conducted through MCR.

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### 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, 2011 | 2012 | 2013 | 2013 Process Recovery |
|---|---|---|---|---|---|
| | | (million metric tons) | | | (%) |
| **Southeastern System** | | | | | |
| *Itabira* | | | | | |
| Cauê | Open pit | 18.6 | 17.8 | 15.9 | 62.3 |
| Conceição | Open pit | 21.4 | 19.9 | 18.1 | 68.8 |
| *Minas Centrais* | | | | | |
| Água Limpa(1) | Open pit | 5.0 | 4.6 | 4.4 | 47.5 |
| Gongo Soco(3) | Open pit | 5.3 | 4.4 | 4.7 | 100.0 |
| Brucutu | Open pit | 30.9 | 31.7 | 28.7 | 73.7 |
| *Mariana* | | | | | |
| Alegria | Open pit | 14.7 | 14.7 | 15.8 | 82.7 |
| Fábrica Nova | Open pit | 13.2 | 13.0 | 12.5 | 67.3 |
| Fazendão | Open pit | 11.1 | 9.5 | 9.3 | 100.0 |
| Total Southeastern System | | 120.2 | 115.6 | 109.5 | |
| **Southern System** | | | | | |
| *Minas Itabirito* | | | | | |
| Segredo/João Pereira | Open pit | 11.8 | 12.2 | 12.0 | 75.6 |
| Sapecado/Galinheiro | Open pit | 18.6 | 19.6 | 19.0 | 69.2 |
| *Vargem Grande* | | | | | |
| Tamanduá | Open pit | 8.8 | 9.7 | 6.7 | 81.3 |
| Capitão do Mato | Open pit | 7.3 | 7.3 | 9.9 | 81.3 |
| Abóboras | Open pit | 5.3 | 5.6 | 5.4 | 100.0 |
| *Paraopeba* | | | | | |
| Jangada | Open pit | 5.1 | 6.1 | 6.9 | 94.2 |
| Córrego do Feijão(3) | Open pit | 6.8 | 6.8 | 5.8 | 94.2 |
| Capão Xavier | Open pit | 8.4 | 9.6 | 9.2 | 87.1 |
| Mar Azul(3) | Open pit | 4.1 | 3.3 | 4.2 | 100.0 |
| Total Southern System | | 76.3 | 80.3 | 79.0 | |
| **Midwestern System** | | | | | |
| Corumbá | Open pit | 4.1 | 4.6 | 4.5 | 79.8 |
| Urucum | Open pit | 1.5 | 1.8 | 2.0 | 69.3 |
| Total Midwestern System | | 5.6 | 6.4 | 6.5 | |
| **Northern System** | | | | | |
| *Serra Norte* | | | | | |
| N4W | Open pit | 38.9 | 39.3 | 31.3 | 93.5 |
| N4E | Open pit | 20.1 | 18.7 | 19.9 | 93.5 |
| N5 | Open pit | 50.8 | 48.8 | 53.6 | 93.5 |
| Total Northern System | | 109.8 | 106.8 | 104.9 | |

| | | | | |
|---|---|---|---|---|
| Vale | 311.8 | 309.0 | 299.8 | |
| Samarco(2) | 10.8 | 10.9 | 10.9 | 56.8 |
| Total | 322.6 | 320.0 | 310.7 | |

(1) Água Limpa mine and plants are owned by Baovale, in which we own 100% of the voting shares and 50% of the total shares. Production figures for Água Limpa have not been adjusted to reflect our ownership interest.

(2) Production figures for Samarco, in which we have a 50% interest, have been adjusted to reflect our ownership interest.

(3) Production figures for these mines or plants include minor operations at other sites with low levels of production and total reserves.

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### 1.1.3 Iron ore pellets operations

Directly and through joint ventures, we produce iron ore pellets in Brazil, Oman and China, as set forth in the following table. Our total estimated nominal capacity is 57.2 Mtpy, including the full capacity of our pelletizing plants in Oman, but not including our joint ventures Samarco, Zhuhai YPM Pellet Co., Ltd. ("Zhuhai YPM") and Anyang Yu Vale Yongtong Pellet Co., Ltd. ("Anyang"). Of our total 2013 pellet production, including the production of our joint ventures, 61.4% was blast furnace pellets and 38.6% was direct reduction pellets, which are used in steel mills that employ the direct reduction process rather than blast furnace technology. We supply all of the iron ore requirements of our wholly-owned pellet plants and part of the iron ore requirements for Samarco and Zhuhai YPM. In 2013, we sold 10.2 million metric tons to Samarco and 1.2 million metric tons to Zhuhai YPM.

| Company/Plant | Description / History | Nominal Capacity (Mtpy) | Power Source | Other Information | Vale's Share (%) | Partners |
|---|---|---|---|---|---|---|
| ***Brazil:*** | | | | | | |
| Vale | | | | | | |
| *Tubarão (state of Espírito Santo)* | Two wholly owned pellet plants (Tubarão I and II) and five leased plants. Receives iron ore from our Southeastern System mines and distribution is made though our logistics infrastructure. | 29.2 | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | Operations at the Tubarão I and II pellet plants have been suspended since November 13, 2012 in response to changes in steel industry demand for raw materials (contraction in pellet consumption in favor of greater use of sinter feed). | 100.0 | |
| *Fábrica (state of Minas Gerais)* | Part of the Southern System. Receives iron ore from the Fábrica mine. Production is transported by MRS and EFVM. | 4.5 | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | | 100.0 | |
| *Vargem Grande (state of Minas Gerais)* | Part of the Southern System. Receives iron ore from the Pico and Vargem Grande mines and the production is transported by MRS. | 7.0 | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | | 100.0 | |
| *São Luís (state of Maranhão)* | Part of the Northern System. Receives iron ore from Carajás and production is shipped to customers through our Ponta da Madeira maritime terminal. | 7.5 | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | On October 8, 2012, we suspended operations at the São Luís pellet plant for reasons similar to those supporting our suspension of operations at the Tubarão I and II plants. | 100.0 | |

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| Company/Plant | Description / History | Nominal Capacity (Mtpy) | Power Source | Other Information | Vale's Share (%) | Partners |
|---|---|---|---|---|---|---|
| Samarco | Three pellet plants with nominal capacity of 22.3 Mtpy. The pellet plants are located in the Ponta Ubu unit, in Anchieta, state of Espírito Santo. | 22.3 | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Samarco. | In 2014, we will start up the fourth pellet plant with a capacity of 8.3 Mtpy, which will increase Samarco's total nominal pellet capacity to 30.5 Mtpy. | 50.0 | BHP Billiton plc |
| ***Oman:*** | | | | | | |
| Vale Oman Pelletizing Company LLC ("VOPC") | Vale's industrial complex. Two pellet plants (totaling 9.0 Mtpy of capacity) for direct reduction pellets. The pelletizing plants are integrated with our distribution center that has a nominal capacity to handle 40.0 Mtpy. | 9.0 | Supplied through the national electricity grid. | In the last quarter of the year, the site reached the monthly nominal capacity. The total volume produced in 2013 was 8.28 Mtpy. | 70.0 | Oman Oil Company S.A.O.C. |
| ***China:*** | | | | | | |
| Zhuhai YPM | Part of the Yueyufeng Steelmaking Complex. It has port facilities, which we use to receive feed from our mines in Brazil. The main customer is Zhuhai Yueyufeng Iron & Steel Co., Ltd. ("YYF"), which is also located in the Yueyufeng Steelmaking Complex. | 1.2 | Supplied through the national electricity grid. | | 25.0 | Zhuhai Yueyufeng Iron and Steel Co. Ltd., Halswell Enterprises Limited |
| Anyang | Pelletizing operation in China with the capacity to produce 1.2 Mtpy that started production in March 2011. | 1.2 | Supplied through the national electricity grid. | | 25.0 | Anyang Iron & Steel Co., Ltd. |

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### 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, 2011 | 2012 | 2013 |
|---|---|---|---|
| | | (million metric tons) | |
| Vale(1) | 39.0 | 43.3 | 39.0 |
| Hispanobras(2) | 2.1 | 1.1 | |
| Samarco(3) | 10.7 | 10.7 | 10.6 |
| Zhuhai YPM(3) | 0.3 | 0.2 | 0.2 |
| Anyang(3) | 0.2 | 0.2 | 0.2 |
| Total | 52.3 | 55.6 | 50.0 |

(1) Figure includes actual production, including full production from our pellet plants in Oman and from the four pellet plants we leased in Brazil in 2008. We signed a 10-year operating lease contract for Itabrasco's pellet plant in October 2008. We signed a five-year operating lease contract for Kobrasco's pellet plant in June 2008, renewed for additional five years in 2013. We signed a 30-year operating lease contract for Nibrasco's two pellet plants in May 2008.

(2) On July 1, 2012, we signed a three-year operating lease for Hispanobras' pellet plant and started to consolidate its output with our production.

(3) Production figures for Samarco, Zhuhai YPM and Anyang have been adjusted to reflect our ownership interest.

### 1.1.5 Customers, sales and marketing

We supply all of our iron ore and iron ore pellets (including our share of joint-venture pellet production) 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 Major factors affecting prices.*

In 2013, China accounted for 47.7% of our iron ore and iron ore pellet shipments, and Asia as a whole accounted for 64.9%. Europe accounted for 18.0%, followed by Brazil with 11.8%. Our 10 largest customers collectively purchased 143.6 million metric tons of iron ore and iron ore pellets from us, representing 47.0% of our 2013 iron ore and iron ore pellet sales volumes and 42.4% of our total iron ore and iron ore pellet revenues. In 2013, no individual customer accounted for more than 10.0% of our iron ore and iron ore pellet shipments.

In 2013, the Asian market (mainly Japan, South Korea and Taiwan) and the European market were the primary markets for our blast furnace pellets, while the Middle East, North America and North Africa were the primary markets for our direct reduction pellets.

We strongly emphasize customer service in order to improve our competitiveness. We work with our customers to understand their main 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 to improve our competitiveness in relation to competitors who may be more conveniently located geographically. In addition to offering technical assistance to our customers, we operate sales support offices in Tokyo (Japan), Seoul (South Korea), Singapore, Dubai (UAE) and Shanghai (China), which support the sales made by Vale International, located in St. Prex, Switzerland, which is a wholly-owned subsidiary of Vale International Holdings GmbH (formerly Vale Austria Holdings GmbH). 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.

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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. We adopt different pricing mechanisms for our sales, generally linked to the Chinese spot market, including basically the following systems: (i) daily spot prices, (ii) spot price after delivery, consisting of a provisional pricing and an adjustment invoice following delivery; (iii) current quarter and monthly averages; and (iv) three-month average with a lag of one month.

**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.

Our biggest competitors in the Asian market are located in Australia and include subsidiaries and affiliates of BHP Billiton plc ("BHP Billiton"), Rio Tinto Ltd ("Rio Tinto") and Fortescue Metals Group Ltd ("FMG"). Although the transportation costs of delivering iron ore from Australia to Asian customers are generally lower than ours as a result of Australia's geographical proximity, 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 grade 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. 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.

In terms of reliability, 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. In addition, we continue to develop a low-cost freight portfolio aimed at enhancing our ability to offer our products in the Asian market at competitive prices and to increase our market share. To support this strategy, we have built a distribution center in Oman and two FTS in the Philippines, and we are investing in a distribution center in Malaysia. We are party to medium- and long-term freight contracts, and we own vessels, including new ships called Valemax. They reduce energy consumption and greenhouse emissions by carrying an increased amount of cargo in a single trip, offering lower freight rates. These investments improve speed and flexibility for customization, and they shorten the time to market required for our products.

Our principal competitors in Europe are Kumba Iron Ore Limited, Luossavaara Kiirunavaara AB ("LKAB"), Société Nationale Industrielle et Minière ("SNIM") and Iron Ore Company of Canada ("IOC"), a subsidiary of Rio Tinto. 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.

The Brazilian iron ore market is also competitive. There are several small iron ore producers and new companies with developing projects, such as Anglo Ferrous Brazil, MMX, Ferrous Resources and Bahia Mineração. Some steel companies, including Gerdau S.A. ("Gerdau"), Companhia Siderúrgica Nacional ("CSN"), V&M do Brasil S.A. ("Mannesmann"), 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, Cliffs Natural Resources Inc., Arcelor Mittal Mines Canada (formerly Quebec Cartier Mining Co.), IOC and Gulf Industrial Investment Co.

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### 1.2 Coal

#### 1.2.1 Operations

We produce metallurgical and thermal coal through our subsidiaries Vale Moçambique, which operates Moatize, and Vale Australia, which operates coal assets in Australia through wholly-owned companies and unincorporated joint ventures. We also have a minority interest in two Chinese companies, Henan Longyu Energy Resources Co., Ltd. ("Longyu") and Shandong Yankuang International Coking Company Limited. ("Yankuang"), as set forth in the following table.

| Company/Mining Site | 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 11 Mtpy, mostly comprised of metallurgical coal. Vale has a 95.0% stake, and the remaining is owned by Empresa Moçambicana de Exploração Mineira, S.A. | Produces metallurgical and thermal coal. Moatize's main branded product is the Chipanga 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 processed at a coal handling and processing plant ("CHPP") with a capacity of 4,000 metric tons per hour. | Mining concession expiring in 2032, renewable thereafter. | Supplied by local utility company. Back up supply on site. | The coal is transported from the mine by the Linha do Sena railway to the port of Beira. |
| ***Vale Australia*** | | | | | | |
| Integra Coal | Hunter Valley, New South Wales | Open-cut mine and underground coal mine, acquired from AMCI in 2007, located 10 kilometers northwest of Singleton in the Hunter Valley of New South Wales, Australia. Vale has a 61.2% stake and the remaining is owned by Nippon Steel ("NSC"), JFE Group ("JFE"), Posco, Toyota Tsusho Austrália, Chubu Electric Power Co. Ltd. | Produces metallurgical and thermal coal. The operations are comprised of an underground coal mine that produces coal by longwall methods and an open-cut mine. Coal from the mines is processed at a CHPP with a capacity of 1,200 metric tons per hour. | Mining tenements expiring in 2023, 2026, 2030 and 2032. | Supplied through the national electricity grid. Acquired from local utility companies. | Production is loaded onto trains and transported 83km to the port of Newcastle, New South Wales, Australia. |
| Carborough Downs | Bowen Basin, Queensland | Acquired from AMCI in 2007. Carborough Downs mining leases overlie the Rangal Coal Measures of the Bowen Basin with the seams of Leichardt and Vermont. Both seams have coking properties and can be beneficiated to produce coking coal and pulverized coal injection ("PCI") products. Vale has a 85.0% stake and the remaining is owned by JFE, Posco, Tata Steel. | Metallurgical coal. The Leichardt seam is currently our main target for development and constitutes 100% of the current reserve and resource base. Carborough Downs coal is processed at the Carborough Downs CHPP, which is capable of processing 1,000 metric tons per hour, and which operates seven days per week. | Mining tenements expiring in 2035 and 2039. | Supplied through the national electricity grid. Acquired from local utility companies. | The product is loaded onto trains at a rail loadout facility and transported 163 kilometers to the Dalrymple Bay Coal Terminal, Queensland, Australia. |

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| Company/Mining Site | Location | Description/History | Mineralization/Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| Isaac Plains | Bowen Basin, Queensland | The Isaac Plains open-cut mine, acquired from AMCI in 2007, is located close to Carborough Downs in central Queensland. The mine is managed by Isaac Plains Coal Management on behalf of the joint venture parties. Vale has a 50.0% stake, and the remaining shares are owned by a subsidiary of Sumitomo. | Metallurgical and thermal coal. The coal is classified as a medium volatile bituminous coal with low sulfur content. Coal is processed at the Isaac Plains CHPP, which has a capacity of 500 metric tons per hour. | Mining tenements expiring in 2025. | Supplied through the national electricity grid. Acquired from local utility companies. | Railed 172 kilometers to the Dalrymple Bay Coal Terminal. |
| ***China*** | | | | | | |
| Longyu | Henan Province, China | Longyu has two operational coal mines, which are located 10km and 5km from Yongcheng city, Henan Province. Vale has a 25.0% stake and the remaining is owned by Yongmei Group Co., Ltd. (former Yongcheng Coal & Electricity (Group) Co. Ltd.), Shanghai Baosteel International Economic & Trading Co., Ltd. and other minority shareholders. Vale acquired a stake in Longyu by purchasing newly issued shares. | Metallurgical and thermal coal and other related products. | Mining concessions expiring in 2034 | Supplied through the national electricity grid. Acquired from local utility companies. | Products are trucked or railed directly to customers in China or railed or trucked to Lianyungang port. |
| Yankuang | Shandong Province, China | Metallurgical coke plant located 10km from Yanzhou city, Shandong Province. Vale has a 25.0% stake and the remaining is owned by Yankuang Group Co. Ltd. and Itochu Corporation. Yankuang was formed by the three shareholders. | Metallurgical coke, methanol, tar oil and benzene. Yankuang has production capacity of 1.7 Mtpy of coke and 200,000 tpy of methanol. | | Supplied through the national electricity grid. Acquired from local utility companies. | Most coke products are railed while other products are trucked directly to customers in China or railed to Rizhao port. |

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### 1.2.2 Production

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

| Operation | Mine type | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | (thousand metric tons) | | |
| Metallurgical coal: | | | | |
| *Vale Australia* | | | | |
| Integra Coal(1) | Underground and open-cut | 467 | 962 | 1,410 |
| Isaac Plains(2) | Open-cut | 635 | 709 | 656 |
| Carborough Downs(3) | Underground | 1,390 | 911 | 2,447 |
| Broadlea(4) | Open-cut | 0 | 0 | 0 |
| *Vale Moçambique* | | | | |
| Moatize(5) | Open-cut | 275 | 2,501 | 2,373 |
| Total metallurgical coal | | 2,766 | 5,083 | 6,885 |
| Thermal coal: | | | | |
| *Vale Colombia* | | | | |
| El Hatillo(6) | Open-cut | 3,565 | | |
| *Vale Australia* | | | | |
| Integra Coal(1) | Open-cut | 325 | 351 | 87 |
| Isaac Plains(2) | Open-cut | 274 | 381 | 347 |
| Broadlea(4) | Open-cut | 0 | 0 | 0 |
| *Vale Moçambique* | | | | |
| Moatize(5) | Open-cut | 342 | 1,267 | 1,444 |
| Total thermal coal | | 4,506 | 1,999 | 1,878 |

(1) These figures correspond to our 61.2% equity interest in Integra Coal, an unincorporated joint venture.

(2) These figures correspond to our 50.0% equity interest in Isaac Plains, an unincorporated joint venture.

(3) These figures correspond to our 85.0% equity interest in Carborough Downs, an unincorporated joint venture.

(4) Broadlea Coal has been on care and maintenance status since December 2009.

(5) Moatize started production in August 2011.

(6) We sold the El Hatillo mine in the second quarter of 2012.

### 1.2.3 Customers and sales

Coal sales from our Australian operations are primarily focused on East Asia. Coal sales from our Moatize operations, in Mozambique, target global steel markets, including Asia, India, Africa, Europe and the Americas. Our Chinese coal joint ventures direct their sales into the Chinese domestic market.

**1.2.4 Competition**

The global coal industry comprises markets for black (metallurgical and thermal) and brown (lignite) coal, and is highly competitive.

Growth in the demand for steel, especially in Asia, underpins strong demand for both metallurgical and thermal coal. We expect robust supply and lower prices for metallurgical coal in the next few years, which will reduce investments in new greenfield projects and may result in supply imbalances in the long term. Port and rail constraints in certain supply regions could lead to limited availability of incremental metallurgical coal production without significant capital expenditures.

Competition in the coal industry is based primarily on the economics of production costs, coal quality and transportation costs. Our key competitive strengths include the strategic geographic location of our current and future supply bases and our production cash costs relative to other producers.

Major participants in the seaborne coal market are subsidiaries, affiliates and joint ventures of BHP Billiton, Glencore Xstrata, Anglo American, Rio Tinto, Teck Cominco, Peabody, Walter Energy and the Shenhua Group, among others.

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### 1.3 Manganese ore and ferroalloys

#### 1.3.1 Manganese ore operations and production

We conduct our manganese mining operations in Brazil through our wholly-owned subsidiaries Vale Manganês S.A. ("Vale Manganês"), Vale Mina do Azul S.A. and MCR. Our mines produce three types of manganese ore products:

- metallurgical ore, used primarily for the production of ferroalloys;
- natural manganese dioxide, suitable for the manufacture of electrolytic batteries; and
- chemical ore, used in several industries for the production of fertilizer, pesticides and animal feed, and used as a pigment in the ceramics industry.

| Mining Site | Company | Location | Description/History | Mineralization | Operations | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|---|
| Azul | Vale Mina do Azul S.A. | State of Pará | Open-pit mining operations and on-site beneficiation plant. | High-grade ores (at least 40% manganese grade). | Crushing and classification steps, producing lumps and fines. | Supplied through the national electricity grid. Acquired from regional utility companies. | 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 one major beneficiation plant. | Low-grade ores (24% manganese grade). | Crushing and screening/dense medium classification steps, producing lumps and fines to the Barbacena and Ouro Preto ferroalloy plants. | Supplied through the national electricity grid. Acquired from regional utility companies. | Manganese ore is transported by trucks to the Ouro Preto and Barbacena ferroalloy plants. |
| Urucum | MCR | State of Mato Grosso do Sul | Underground mining operations and on-site beneficiation plant. | High-grade ores (at least 40% manganese grade). | Crushing and classification steps, producing lumps and fines. | Supplied through the national electricity grid. Acquired from regional utility companies. | Manganese ore is transported to the port of Rosario (Argentina) by barges traveling along the Paraguay and Paraná rivers. |

The following table sets forth information about our manganese production.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 | 2013 Process Recovery |
|---|---|---|---|---|---|
| | | (million metric tons) | | | (%) |
| Azul | Open pit | 2.1 | 1.9 | 1.9 | 57.8 |
| Morro da Mina | Open pit | 0.1 | 0.2 | 0.1 | 65.6 |
| Urucum | Underground | 0.3 | 0.3 | 0.4 | 81.9 |
| Total | | 2.5 | 2.4 | 2.4 | |

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### 1.3.2 Ferroalloys operations and production

We conduct our ferroalloys business through our wholly-owned subsidiary Vale Manganês.

The production of ferroalloys consumes significant amounts of electricity, representing 5.7% of our total consumption in 2013. The electricity supply to our ferroalloy plants is provided through power purchase agreements. For information on the risks associated with potential energy shortages, see *Risk factors*.

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 six furnaces, two refining stations and a briquetting plant. Ouro Preto has three furnaces. | 74,000 tons per year at Barbacena plant and 65,000 tons per year at Ouro Preto plant. | Supplied through the national electricity grid. Energy acquired from independent producers through power purchase agreements. |
| Bahia Plant | City of Simões Filho | Four furnaces, two converters and a sintering plant. | 150,000 tons per year. | Supplied through the national electricity grid. Energy acquired from independent producers through power purchase agreements. |

The following table sets forth information about our ferroalloys production.

| | Production for the year ended December 31, | | |
|---|---|---|---|
| Plant | 2011 | 2012 | 2013 |
| | (thousand metric tons) | | |
| Barbacena | 67 | 65 | 45 |
| Ouro Preto | 61 | 62 | 48 |
| Simões Filho | 76 | 79 | 82 |
| Total | 204 | 206 | 175 |

### 1.3.3 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-grade manganese ore competes on a global seaborne basis, while low-grade ore competes on a regional basis. For some ferroalloys, high-grade ore is mandatory, while for others high- and low-grade ores are complementary. 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, Ghana, Kazakhstan, India and Mexico.

The ferroalloy market is characterized by a large number of participants who compete primarily on the basis of price. The principal competitive factors in this market are the costs of manganese ore, electricity, logistics and reductants. We compete with both stand-alone producers and integrated producers that also mine their own ore. Our competitors are located principally in countries that produce manganese ore or steel. For further information about demand and prices, see *Operating and financial review and prospects Major factors affecting prices.*

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## 2. Base metals

### 2.1 Nickel

#### 2.1.1 Operations

We conduct our nickel operations primarily through our wholly-owned subsidiary Vale Canada, which operates two nickel production systems, one in the North Atlantic and the other in the Asia Pacific. A third nickel production system, Onça Puma, in the South Atlantic, resumed its ramp-up activities in late 2013. Our nickel operations are set forth in the following table.

| Mining System/Company | Location | Description/History | Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| ***North Atlantic*** | | | | | | |
| 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. Vale acquired the Sudbury operations in 2006. | Primarily underground mining operations with nickel sulfide ore bodies, which also contain some copper, cobalt, PGMs, gold and silver. Construction of the Totten mine was completed in 2013.<br><br>We also smelt and refine an intermediate product, nickel concentrate, from our Voisey's Bay operations. 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. We also have capabilities to ship nickel oxide to our Asian refineries. | Patented mineral rights with no expiration date; mineral leases expiring between 2014 and 2025; and mining license of occupation with indefinite expiration date. | Supplied by Ontario's provincial electricity grid and produced directly by Vale. | 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 | Integrated mining, milling, smelting and refining operations to process ore into finished nickel with a nominal capacity of 45,000 metric tons of refined nickel per year. Thompson mineralization was discovered in 1956 and was acquired by Vale in 2006. | Primarily underground mining operations with nickel sulfide ore bodies, which also contain some copper and cobalt.<br><br>Local concentrate combines with nickel concentrate from our Voisey's Bay operations for smelting and refining to high quality nickel plate product. Smelting and refining are being considered for phase out in Thompson, due to pending federal sulfur dioxide | Order in Council leases expiring between 2020 and 2030; mineral leases expiring in 2034. | Supplied by the Provincial utility company. | Finished products are delivered to market by truck in North America. For overseas customers, the products are loaded into containers and travel intermodally (truck/rail/containership) to final destination through both west coast and east coast Canadian ports. |

| | |
|---|---|
| | emission standards that are expected to come into effect in 2015. |

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| Mining System/Company | Location | Description/History | Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| Vale Newfoundland & Labrador Limited | Canada Voisey's Bay, Newfoundland and Labrador | Open-pit mining and milling of ore into intermediate products-nickel and copper concentrates. Voisey's Bay's operations started in 2005 and were purchased by Vale in 2006. | Comprised of the Ovoid open pit mine, and deposits with the potential for underground operations at a later stage. We mine nickel sulfide ore bodies, which also contain some copper and cobalt. Nickel concentrates are currently shipped to our Sudbury and Thompson operations for final processing (smelting and refining) while copper concentrate is sold in the market. Once the Long Harbour refinery is operational, our nickel concentrate from Labrador will be redirected to the facility and processed on a prioritized basis. | Mining lease expiring in 2027. | 100% supplied through Vale owned diesel generators. | The nickel and copper concentrates are transported to the port by haulage trucks and then shipped by drybulk vessels to either overseas markets or to our Canadian 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. Clydach's refinery commenced operations in 1902 and was acquired by Vale in 2006. | Processes a nickel intermediate product, nickel oxide, supplied from either our Sudbury or 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. Product for overseas customers are trucked to the ports of Southhampton and Liverpool and shipped by ocean container. |

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| Mining System/Company | Location | Description/History | Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| ***Asia Pacific*** | | | | | | |
| PT Vale Indonesia Tbk ("PTVI", previously PT International Nickel Indonesia Tbk) | Indonesia Sulawesi Sorowako, | 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 59.3% of PTVI's share capital, Sumitomo Metal Mining Co., Ltd ("Sumitomo") holds 20.1%, Sumitomo Corporation holds 0.1% and the public holds 20.5%. PTVI was established in 1968, commenced its commercial operations in 1978 and was acquired by Vale in 2006. | PTVI mines nickel laterite ore and produces nickel matte, which is shipped primarily to nickel refineries 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, which is currently being renegotiated with the Indonesian government. | Produced primarily by PVTI'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 to Japan. |
| Vale Nouvelle-Calédonie S.A.S ("VNC") | New Caledonia Province Southern | Mining and processing operations (producer of nickel oxide and cobalt carbonate). VNC's shares are held by Vale (80.5%), Sumic (14.5%) and Société de Participation Minière du Sud Caledonien SAS ("SPMSC") (5%). (1) | We are currently ramping up our nickel operation in New Caledonia. VNC utilizes a High Pressure Acid Leach ("HPAL") process to treat limonitic laterite and saprolitic laterite ores. We expect to continue to ramp-up VNC over the next three years to reach nominal production capacity of 57,000 metric tons per year of nickel contained in nickel oxide, which will be further processed in our facilities in Asia, and hydroxide cake form, and 4,500 metric tons of cobalt in carbonate form. | Mining concessions expiring between 2015 and 2051. | Supplied through the national electricity grid and by independent producers. | Products are packed into containers and are trucked approximately 4km to Prony port. |

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| Mining System/Company | Location | Description/History | Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| Vale Japan Limited | Japan Matsuzaka | Stand-alone nickel refinery (producer of intermediate and finished nickel), with nominal capacity of 60,000 metric tons per year. Vale owns 87.2% of the shares, and Sumitomo owns the remaining shares. The refinery was built in 1965 and was acquired by Vale in 2006. | Produces intermediate products for further processing in our refineries in China, Korea and Taiwan, 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 stuffed into containers at the plant and shipped from the ports of Yokkaichi and Nagoya. |
| Vale Taiwan Ltd | 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 Vale in 2006. | Produces finished nickel primarily for the stainless steel industry, using intermediate products from our Matsuzaka and New Caledonian operations. | | 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 stuffed 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. Vale owns 98.3% of the shares 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, using intermediate products primarily from our Matsuzaka and New Caledonian operations. | | Supplied through the national electricity grid. Acquired from regional utility companies. | Product moved 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. |
| Korea Nickel Corporation | South Korea Onsan | Stand-alone nickel refinery (producer of finished nickel), with nominal capacity of 30,000 metric tons per year. Vale owns 25.0% of the shares, and the remaining shares are held by Korea Zinc Co., Ltd, Posteel Co., Ltd, Young Poong Co., Ltd. and others. The refinery commenced production in 1989. | Produces finished nickel for the local stainless steel industry in Korea, primarily using intermediate products containing about 75% nickel (in the form of nickel oxide) primarily from our Matsuzaka operations. | | Supplied through the national electricity grid. Acquired from regional utility companies. | KNC's production is moved by truck over public roads to customers in Korea and is exported in containers to overseas customers from the ports of Busan and Ulsan. |

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| Mining System/Company | Location | Description/History | Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| ***South Atlantic*** | | | | | | |
| Vale/Onça Puma | Brazil Ourilândia do Norte, Pará | Mining, smelting and refining operation producing a high quality ferronickel for application within the stainless steel industry. | The Onça Puma mine is built on lateritic nickel deposits of saprolitic laterite ore. The operation produces ferronickel via the rotary kiln-electric furnace process. We resumed operations with a single line in 2013, with first metal being produced in the fourth quarter of 2013. The nominal capacity of the single line operation is estimated at 25,000 metric tons per year. We will evaluate opportunities to restart the second line operations in light of market outlook and single line furnace performance considerations. | Mining concession for indefinite period. | Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale. | The ferro-nickel is transported by public paved road and EFC railroad to the Itaqui maritime terminal in the state of Maranhão. It is exported in ocean containers. |

(1) Sumic, a joint venture between Sumitomo and Mitsui, has a put option to sell us all of its shares in VNC under certain conditions see Note 31 to our consolidated financial statements. Once the start-up of commercial production is reached at VNC, Sumic will have an option to purchase 6.5% of VNC, which represents the dilution in Sumic's shareholding that occurred as a result of an October 2012 agreement. SPMSC has an obligation to increase its stake in VNC to 10% within two years after the start-up of commercial production.

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### 2.1.2 Production

The following table sets forth our annual mine production by operating mine (or on an aggregate basis for PTVI because it has mining areas rather than mines) and the average percentage grades of nickel and copper. The mine production at PTVI represents the product from PTVI's dryer kilns delivered to PTVI's smelting operations and does not include nickel losses due to 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. The following table sets forth information about ore production at our nickel mining sites.

| | 2011 | | | 2012 | | | 2013 | | |
|---|---|---|---|---|---|---|---|---|---|
| | (thousands of metric tons, except percentages) | | | | | | | | |
| | | Grade | | | Grade | | | Grade | |
| | Production | % Copper | % Nickel | Production | % Copper | % Nickel | Production | % Copper | % Nickel |
| *Ontario operating mines* | | | | | | | | | |
| Copper Cliff North | 892 | 1.15 | 1.03 | 792 | 1.09 | 0.92 | 913 | 1.32 | 1.28 |
| Creighton | 991 | 1.72 | 2.22 | 797 | 1.80 | 1.84 | 915 | 2.01 | 2.19 |
| Stobie | 1,568 | 0.61 | 0.74 | 2,006 | 0.56 | 0.66 | 1,887 | 0.59 | 0.65 |
| Garson | 640 | 1.78 | 2.08 | 643 | 1.56 | 1.61 | 815 | 1.42 | 1.75 |
| Coleman | 1,363 | 3.02 | 1.77 | 1,062 | 2.58 | 1.51 | 1,515 | 3.15 | 1.52 |
| Ellen | 131 | 0.45 | 0.90 | 371 | 0.44 | 0.93 | 109 | 0.49 | 1.00 |
| Totten | 28 | 1.01 | 0.97 | 6 | 2.37 | 1.15 | 64 | 1.84 | 1.92 |
| Gertrude | - | - | - | 36 | 0.27 | 0.72 | 196 | 0.32 | 0.89 |
| Total Ontario operations | 5,612 | 1.61% | 1.45% | 5,714 | 1.29% | 1.14% | 6,414 | 1.61% | 1.33% |
| *Manitoba operating mines* | | | | | | | | | |
| Thompson | 1,182 | - | 1.76 | 1,160 | - | 1.86 | 1,175 | - | 2.07 |
| Birchtree | 721 | - | 1.36 | 643 | - | 1.34 | 613 | - | 1.39 |
| Total Manitoba operations | 1,903 | - | 1.61% | 1,804 | - | 1.67% | 1,788 | - | 1.84% |
| *Voisey's Bay operating mines* | | | | | | | | | |
| Ovoid | 2,366 | 2.39% | 3.38% | 2,351 | 1.94% | 3.11% | 2,318 | 1.68% | 2.89% |
| *Sulawesi operating mining areas* | | | | | | | | | |
| Sorowako | 3,848 | - | 1.95% | 3,678 | - | 2.02% | 4,369 | - | 2.00% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *New Caledonia operating mines* | | | | | | | | | |
| VNC | 1,043 | - | 1.29% | 1,179 | - | 1.27% | 1,860 | - | 1.36% |
| *Brazil operating mines* | | | | | | | | | |
| Onça Puma | 1,466 | - | 1.86% | 1,975 | - | 1.87% | 263 | - | 2.28% |

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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 an ore-source basis.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | (thousand metric tons) | | |
| Sudbury(1) | Underground | 59.7 | 65.5 | 69.4 |
| Thompson(1) | Underground | 25.0 | 24.2 | 24.5 |
| Voisey's Bay(2) | Open pit | 68.9 | 61.9 | 63.0 |
| Sorowako(3) | Open cast | 67.8 | 69.0 | 78.8 |
| Onça Puma(4) | Open pit | 7.0 | 6.0 | 1.9 |
| New Caledonia(5) | Open pit | 5.1 | 4.5 | 16.3 |
| External(6) | - | 8.0 | 5.9 | 6.4 |
| Total(7) | | 241.5 | 237.0 | 260.2 |

(1) Primary nickel production only (i.e., does not include secondary nickel from unrelated parties).

(2) Includes finished nickel produced at our Sudbury and Thompson operations.

(3) We have a 59.3% interest in PTVI, which owns the Sorowako mines, and these figures include the minority interests.

(4) Primary production only. Nickel contained in ferro-nickel.

(5) We have a 80.5% interest in VNC, and these figures include minority interests. Nickel contained in NHC and NiO.

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

(7) 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 2013, 44% of our total nickel sales were delivered to customers in Asia, 28% to North America, 27% to Europe and 1% 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, listed on the LME, 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 has various levels of nickel content, (ii) nickel pig iron has 1.5-6% nickel, (iii) ferro-nickel has 10-40% 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 (v) high purity nickel has a minimum of 99.9% nickel and does not contain specific elemental impurities;

- shape (such as pellets, discs, squares, and strips); and

size.

In 2013, the principal end-use applications for nickel were:

austenitic stainless steel (66% of global nickel consumption);

non-ferrous alloys, alloy steels and foundry applications (17% of global nickel consumption);

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nickel plating (7% of global nickel consumption); and

specialty applications, such as batteries, chemicals and powder metallurgy (10% of global nickel consumption).

In 2013, 63% of our refined nickel sales were made into non-stainless steel applications, compared to the industry average for primary nickel producers of 34%, which brings 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.

We offer sales and technical support to our customers on a global basis. 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 offices in St. Prex (Switzerland), Saddle Brook, New Jersey (United States), Tokyo (Japan), Shanghai (China), Singapore and Kaohsiung (Taiwan). For information about demand and prices, see *Operating and financial review and prospects 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 technical support direct our products to the applications and geographic regions that offer the highest margins for our products.

Our nickel deliveries represented 13% of global consumption for primary nickel in 2013. In addition to us, the largest suppliers in the nickel industry (each with its own integrated facilities, including nickel mining, processing, refining and marketing operations) are Mining and Metallurgical Company Norilsk Nickel ("Norilsk"), Jinchuan Nonferrous Metals Corporation ("Jinchuan"), Glencore Xstrata and BHP Billiton. Together with us, these companies accounted for about 47% of global refined primary nickel production in 2013.

While stainless steel production is a major driver of global nickel demand, stainless steel producers can use nickel products 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. In recent years, secondary nickel has accounted for about 44-47% of total nickel used for stainless steels, and primary nickel has accounted for about 53-56%. Nickel pig iron, a low-grade nickel product made in China from imported lateritic ores (primarily from the Philippines and Indonesia), is primarily suitable for use in stainless steel production. With higher nickel prices and strong demand from the stainless steel industry, Chinese domestic production of nickel pig iron and low-grade ferro-nickel continues to expand. In 2013, Chinese nickel pig iron and ferro-nickel production is estimated to have been 490,000 metric tons, representing 25% of world primary nickel supply. We expect that the implementation of the Indonesian mining law, which restricts the export of unprocessed ores, may affect Chinese nickel pig iron and ferro-nickel production going forward.

Competition in the nickel market is based primarily on quality, 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.

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### 2.2 Copper

#### 2.2.1 Operations

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

| Mining Site/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 and started production in 2004. | 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 indefinite period. | Supplied through the national electricity grid. Acquired from Eletronorte, pursuant to power purchase agreements or produced directly by Vale. | We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Ponta da Madeira maritime terminal in São Luís, in the state of Maranhão. We constructed an 85-kilometer road to link Sossego to Parauapebas. |
| Vale/Salobo | Carajás, state of Pará. | Salobo I processing plant is ramping up to a total capacity of 100,000 tpy of copper in concentrates. Salobo is expected to reach a total capacity of 200,000 tpy by 2016, after Salobo II expansion. | Our Salobo copper and gold 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 indefinite period. | Supplied through the national electricity grid. Acquired from Eletronorte, pursuant to power purchase agreements or produced directly by Vale. | We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Ponta da Madeira maritime terminal in São Luís, in the state of Maranhão. We constructed a 90-kilometer road to link Salobo to Parauapebas. |

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| Mining Site/Location | Location | Description/History | Mineralization/Operations | Mining Title | Power Source | Access/Transportation |
|---|---|---|---|---|---|---|
| ***Canada*** | | | | | | |
| Vale Canada | Canada Sudbury, Ontario | See *Base metals Nickel Operations* | We produce two intermediate copper products, copper concentrates and copper anodes, and we also produce electrowon copper cathode as a by-product of our nickel refining operations. | Please refer to the table in our Nickel Operations | | |
| Vale Canada/ Voisey's Bay | Canada Voisey's Bay, Newfoundland and Labrador | See *Base metals Nickel Operations* | At Voisey's Bay, we produce copper concentrates. | Please refer to the table in our Nickel Operations | | |
| ***Zambia*** | | | | | | |
| Lubambe | Zambian Copperbelt | Lubambe (previously Konkola North) copper mine, which includes an underground mine, plant and related infrastructure. TEAL (our 50/50 joint venture with ARM) has an 80% stake in Lubambe. Zambia Consolidated Copper Mines Investment Holding PLC Ltd. holds the remaining (20%) stake. | Nominal production capacity of 45,000 metric tons per year of copper in concentrates. Production started in October 2012. | Mining concessions expiring in 2033. | Long-term energy supply contract with Zesco (Zambian state owned power supplier). | Copper concentrates are transported by truck to local smelters. |

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### 2.2.2 Production

The following table sets forth information on our copper production.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | (thousand metric tons) | | |
| *Brazil:* | | | | |
| Salobo | Open pit | - | 13 | 65 |
| Sossego | Open pit | 109 | 110 | 119 |
| *Canada:* | | | | |
| Sudbury | Underground | 101 | 79 | 103 |
| Voisey's Bay | Open pit | 51 | 42 | 36 |
| Thompson | Underground | 1 | 3 | 2 |
| External(1) | - | 31 | 29 | 24 |
| *Chile:* | | | | |
| Tres Valles(2) | Open pit and underground | 9 | 14 | 11 |
| *Zambia:* | | | | |
| Lubambe(3) | Underground | - | 1 | 9 |
| Total | | 302 | 290 | 370 |

(1) We process copper at our facilities using feed purchased from unrelated parties.
(2) We sold Tres Valles mine in December 2013. The 2013 production is by the end of October.
(3) Vale's attributable production capacity of 40%.

### 2.2.3 Customers and sales

We sell copper concentrates from Sossego and Salobo phase I under medium and long-term contracts to copper smelters in South America, Europe, India and Asia. We have medium-term copper supply agreements with Glencore Canada Corporation for the sale of copper anodes and most of the copper concentrates produced in Sudbury. We sell copper concentrates from Voisey's Bay under medium-term contracts to customers in Europe. We sell electrowon copper from Sudbury in North America under short-term sales agreements.

### 2.2.4 Competition

The global copper market is highly competitive. Producers are integrated mining companies and custom smelters, covering all regions of the world, while consumers are principally wire rod and copper-alloy producers. Competition occurs mainly on a regional level and is based primarily on production costs, quality, reliability of supply and logistics costs. The world's largest copper cathode producers are Corporación Nacional del Cobre de Chile ("Codelco"), Aurubis AG, Glencore Xstrata, Freeport-McMoRan Copper & Gold Inc. ("Freeport-McMoRan") and Jiangxi Copper Corporation Ltd., operating at the parent-company level or through subsidiaries. Our participation in the global copper market is marginal.

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

In the copper concentrate market, mining occurs on a world basis with a predominant share from South America, while consumers are custom smelters located 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 BHP Billiton, Antofagasta plc, Freeport McMoRan, Glencore Xstrata, Codelco and Rio Tinto, operating at the parent-company level or through subsidiaries. Our market share in 2013 was about 4% of the total custom copper concentrate market.

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The copper anode/blister market has very limited trade within the copper industry; generally, anodes are produced to supply each company's integrated refinery. The trade in anodes/blister is limited to those facilities that have more smelting capacity than refining capacity or to those situations where logistics cost savings provide an incentive to source anodes from outside smelters. The largest competitors in the copper anode market in 2013 included Codelco, Glencore Xstrata, China Nonferrous Metals and Anglo American, operating at the parent-company level or through subsidiaries.

**2.3 PGMs and other precious metals**

As by-products of our Sudbury nickel operations in Canada, we recover significant quantities of PGMs, as well as small quantities of gold and silver. We also recover gold as a by-product of our operations at our Salobo and Sossego copper mines in Carajás, in the Brazilian state of Pará. We operate a processing facility in Port Colborne, Ontario, which produces PGMs, gold and silver intermediate products using feed from our Sudbury operation. We have a refinery in Acton, England, where we process our intermediate products, as well as feeds purchased from unrelated parties and toll-refined materials. In 2013, PGM concentrates from our Canadian operations supplied about 55% of our PGM production, which also includes metals purchased from unrelated parties. Our base metals marketing department sells our own PGMs and other precious metals, as well as products from unrelated parties and toll-refined products, on a sales agency basis.

In February 2013, we sold to Silver Wheaton 25% of the gold produced as a by-product at our Salobo copper mine, in Brazil, for the life of that mine, and 70% of the gold produced as a by-product at our Sudbury nickel mines, in Canada, for 20 years. Pursuant to the gold stream contract, Silver Wheaton received 34,325 oz of gold in 2013.

The following table sets forth information on our precious metals production.

| Mine(1) | Type | 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | (thousand troy ounces) | | |
| Sudbury: | | | | |
| Platinum | Underground | 174 | 134 | 145 |
| Palladium | Underground | 248 | 251 | 352 |
| Gold | Underground | 182 | 69 | 91 |
| Salobo: | | | | |
| Gold | Open pit | - | 20 | 117 |
| Sossego: | | | | |
| Gold | Open pit | 90 | 75 | 78 |

(1) Production figures exclude precious metals purchased from unrelated parties and toll-refined materials.

**2.4 Cobalt**

We recover significant quantities of cobalt, classified as a minor metal, as a by-product of our nickel operations. In 2013, we produced 1,550 metric tons of refined cobalt metal at our Port Colborne refinery, 685 metric tons of cobalt in a cobalt-based intermediate product at our nickel operations in Canada and New Caledonia, and our remaining cobalt production consisted of 1,297 metric tons of cobalt contained in other intermediate products (such as nickel concentrates). As a result of the ramp-up of VNC operations in New Caledonia, our production of cobalt intermediate as a by-product of our nickel production will increase. We sell cobalt on a global basis. Our cobalt metal is electro-refined at our Port Colborne refinery and has very high purity levels (99.8%), which is superior to 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.

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The following table sets forth information on our cobalt production.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | | (metric tons) | |
| Sudbury | Underground | 593 | 589 | 853 |
| Thompson | Underground | 158 | 96 | 292 |
| Voisey's Bay | Open pit | 1,585 | 1,221 | 1,256 |
| New Caledonia | Open pit | 245 | 385 | 1,117 |
| External sources(1) | - | 93 | 52 | 13 |
| Total | | 2,675 | 2,343 | 3,532 |

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

**3. Fertilizer nutrients**

**3.1 Phosphates**

We operate our phosphates business through subsidiaries and joint ventures, as set forth in the following table.

| Company | Location | Our share of capital Voting | Total | Partners |
|---|---|---|---|---|
| | | (%) | | |
| Vale Fertilizantes | Uberaba, Brazil | 100.0 | 100.0 | |
| MVM Resources International, B.V. | Bayóvar, Peru | 51.0 | 40.0 | Mosaic, Mitsui & Co |
| Vale Cubatão. | Cubatão, Brazil | 100.0 | 100.0 | |

Vale Fertilizantes is a producer of phosphate rock, phosphate fertilizers ("P") (e.g., monoammonium phosphate ("MAP"), dicalcium phosphate ("DCP"), triple superphosphate ("TSP") and single superphosphate ("SSP")) and nitrogen ("N") fertilizers (e.g., ammonia and ammonium nitrate). It is the largest producer of phosphate and nitrogen crop nutrients in Brazil. Vale Fertilizantes operates the following phosphate rock mines, through concessions for indefinite period: Catalão, in the state of Goiás, and Tapira, Patos de Minas and Araxá, all in the state of Minas Gerais, and Cajati, in the state of São Paulo, in Brazil. In addition, Vale Fertilizantes has nine processing plants for the production of phosphate and nitrogen nutrients, located at Catalão, Goiás; Araxá, Patos de Minas and Uberaba, Minas Gerais; Guará, Cajati, and three plants in Cubatão, São Paulo. In July 2013, we concluded the sale of Araucária operations for US$234 million to Petrobras.

Since 2010 we have also operated the Bayóvar phosphate rock mine in Peru, with nominal capacity of 3.9 Mtpy, through a concession for indefinite period.

The following table sets forth information about our phosphate rock production.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|---|
| | | | (thousand metric tons) | |
| Bayóvar | Open pit | 2,544 | 3,209 | 3,546 |
| Catalão | Open pit | 947 | 1,026 | 1,057 |
| Tapira | Open pit | 2,011 | 2,068 | 1,869 |
| Patos de Minas | Open pit | 44 | 44 | 53 |
| Arax | Open pit | 1,231 | 1,084 | 1,111 |
| Cajati | Open pit | 582 | 550 | 640 |

| | | | |
|---|---|---|---|
| Total | 7,359 | 7,982 | 8,277 |

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The following table sets forth information about our phosphate and nitrogen nutrients production.

| Product | Production for the year ended December 31, 2011 | 2012 | 2013 |
|---|---|---|---|
| | | (thousand metric tons) | |
| Monoammonium phosphate (MAP) | 823 | 1,201 | 1,128 |
| Triple superphosphate (TSP) | 811 | 913 | 905 |
| Single superphosphate (SSP) | 2,638 | 2,226 | 2,102 |
| Dicalcium phosphate (DCP) | 580 | 511 | 444 |
| Ammonia | 619 | 475 | 347 |
| Urea | 628 | 483 | 219 |
| Nitric acid | 468 | 478 | 416 |
| Ammonium nitrate | 458 | 490 | 419 |

### 3.2 Potash

We conduct potash operations in Brazil at the parent-company level, with mining concessions of indefinite duration. We have leased Taquari-Vassouras, the only potash mine in Brazil (in Rosario do Catete, in the state of Sergipe), from Petrobras since 1992. In April 2012, we extended the lease for 30 more years. The following table sets forth information on our potash production.

| Mine | Type | Production for the year ended December 31, 2011 | 2012 | 2013 | 2013 Process Recovery |
|---|---|---|---|---|---|
| | | | (thousand metric tons) | | (%) |
| Taquari-Vassouras | Underground | 625 | 549 | 492 | 85.9 |

### 3.3 Customers and sales

All potash sales from the Taquari-Vassouras mine are to the Brazilian market. In 2013, our production represented approximately 6% of total potash consumption in Brazil. We have a strong presence and long-standing relationships with the major market participants in Brazil, with more than 60% of our sales generated from four long-term customers.

Our phosphate products are mainly sold to fertilizer blenders. In 2013, our sales represented approximately 27% of total phosphate consumption in Brazil, with imports representing 56% of total supply. In the high-concentration segment our production supplied more than 32% of total Brazilian consumption, with products like MAP and TSP. In the low-concentration phosphate nutrients segment our sales represented approximately 33% of total Brazilian consumption, with products like SSP.

### 3.4 Competition

The industry is divided into three major nutrients: potash, phosphate and nitrogen. There are limited resources of potash around the world, with Canada, Russia and Belarus being the most important sources, each of which having only a few producers. The industry presents a high level of investment and a long time required for a project to mature. In addition, the potash industry is highly concentrated, with the 10 major producers accounting for more than 95% of total world production capacity. While potash is a scarcer resource, phosphate is more available, but all major exporters are located in the northern region of Africa (Morocco, Algeria and Tunisia) and in the United States. The top five phosphate rock producers (China, Morocco, United States, Russia and Brazil) account for 79% of global production, of which roughly 14% is exported. However, higher value-added products such as MAP and DAP are usually traded instead of phosphate rock due to cost efficiency.

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Brazil is one of the largest agribusiness markets in the world due to its high production, exports and consumption of grains and biofuels. It is the fourth-largest consumer of fertilizers in the world and one of the largest importers of potash, phosphates, phosphoric acid and urea. Brazil imports 93% of its potash consumption, which amounted to 8.1 Mtpy of KCl (potassium chloride) in 2013, 15% higher than 2012, from Canadian, German, Russian, Belarusian and Israeli producers, in descending order. In terms of global consumption, China, the United States, Brazil and India represent 58% of the total, with Brazil alone representing 17% of the total. Our fertilizer projects are highly competitive in terms of cost and logistics to supply the Brazilian market.

Most phosphate rock concentrate is consumed locally by downstream integrated producers, with the seaborne market corresponding to 14% of total phosphate rock production. Major phosphate rock exporters are concentrated in North Africa, mainly through state-owned companies, with Moroccan OCP Group holding 30% of the total seaborne market. Brazil imports 56% of the total phosphate nutrients it needs through both phosphate fertilizer products and phosphate rock. The phosphate rock imports supply non-integrated producers of phosphate fertilizer products such as SSP, TSP and MAP.

Nitrogen-based fertilizers are derived primarily from ammonia (NH3), which, in turn, is made from nitrogen present in the air and natural gas, making this an energy-intensive nutrient. Ammonia and urea are the main inputs for nitrogen-based fertilizers. Consumption of nitrogen-based fertilizers has a regional profile due to the high cost associated with transportation and storage of ammonia, which requires refrigerated and pressurized facilities. As a result, only 11% of the ammonia produced worldwide is traded. North America is the main importer, accounting for 33% of global trade. Main exporting regions are Central America, Russia, Eastern Europe and the Middle East.

## 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. One of these subsidiaries is VLI, which provides integrated logistics solutions through 9,742 km of railroads (FCA, FNS, EFVM and EFC), five inland terminals with a total storage capacity of 509,320 tons and three maritime terminals and ports operations. We currently own 100% of the stock of VLI, but we have agreed to sell interests in VLI to Mitsui, FI-FGTS and Brookfield, and upon closing, we will hold a 37.6% stake in VLI. We currently account for VLI in our financial statements as an asset held for sale. For more information, see *Business overview Significant changes in our business Sale of stakes in VLI.*

| 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 cargo logistics assets | Brazil | 37.6 | 37.6 | FI-FGTS, Mitsui and Brookfield |
| FCA(1)(2) | Railroad operations | Brazil | 37.6 | 37.6 | FI-FGTS, Mitsui and Brookfield |
| FNS(1)(2) | Railroad operations | Brazil | 37.6 | 37.6 | FI-FGTS, Mitsui and Brookfield |
| MRS | Railroad operations | Brazil | 46.8 | 47.6 | CSN, Usiminas and Gerdau |
| CPBS | Port and maritime terminal operations | Brazil | 100.0 | 100.0 | |
| PTVI | Port and maritime terminal operations | Indonesia | 59.3 | 59.3 | Sumitomo, public investors |

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| Company | Business | Location | Our share of capital | | Partners |
|---|---|---|---|---|---|
| | | | Voting | Total | |
| | | | (%) | | |
| Vale Logística Argentina | Port operations | Argentina | 100.0 | 100.0 | |
| CEAR(3) | Railroad | Malawi | 43.4 | 43.4 | Portos e Caminhos de Ferro de Moçambique, E.P. |
| CDN(4) | Railroad and maritime terminal operations | Mozambique | 43.4 | 43.4 | Portos e Caminhos de Ferro de Moçambique, E.P. |
| CLN | Railroad and port operations | Mozambique | 80.0 | 80.0 | Portos e Caminhos de Ferro de Moçambique, E.P. |
| Vale Logistics Limited | Railroad operations | Malawi | 100.0 | 100.0 | |
| Transbarge Navegación | Paraná and Paraguay Waterway System (Convoys) | Paraguay | 100.0 | 100.0 | |
| VNC | Port and maritime terminal operations | New Caledonia | 80.5 | 80.5 | Sumic, SPMSC |

(1) Vale currently owns 100% of the total and voting stock of VLI. Upon completion of the sales to Mitsui, FI-FGTS and Brookfield, Vale will hold the voting and total stakes indicated in this table. Vale, Mitsui, FI-FGTS and Brookfield will jointly control VLI through a shareholders' agreement.

(2) FCA and FNS are controlled by VLI.

(3) Vale controls its interest in CEAR through an 85% interest in SDCN.

(4) Vale controls its interest in CDN through an 85% interest in SDCN.

### 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 905-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 601 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 use railroad transportation capacity on our EFVM railroad. In 2013, the EFVM railroad transported a daily average of 321,890 metric tons of iron ore, or a total of 77.53 billion ntk of iron ore and other cargo, of which 15.56 billion ntk, or 20.1%, consisted of cargo transported for customers, including iron ore for Brazilian customers. The EFVM railroad also carried 890 thousand passengers in 2013. In 2013, we had a fleet of 321 locomotives and 15,212 wagons at EFVM.

*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 892 kilometers from our Carajás mines to our Ponta da Madeira maritime terminal complex facilities located near the Itaqui Port. Its main cargo is iron ore, principally carried for us. VLI has rights to use railroad transportation capacity on our EFC railroad. In 2013, the EFC railroad transported a daily average of 296,155 metric tons of iron ore. In 2013, the EFC railroad carried a total of 102.03 billion ntk of iron ore and other cargo, 3.50 billion ntk of which was cargo for customers, including iron ore for Brazilian customers. EFC also carried 308 thousand passengers in 2013. EFC supports the largest train, in terms of capacity, in Latin America, which measures 3.4 kilometers, weighs 41,838 gross metric tons when loaded and has 330 cars. In 2013, EFC had a fleet of 266 locomotives and 16,434 wagons.

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

- iron ore and iron ore pellets, carried for us and customers;
- steel, coal, pig iron, limestone and other raw materials carried for customers with steel mills located along the railroad;

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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 the weight of the freight in question, and are regulated by the Brazilian transportation regulatory agency, ANTT (*Agência Nacional de Transportes Terrestres*).

*Ferrovia Centro-Atlântica* ("*FCA*"). FCA is a subsidiary of VLI, which operates the central-east regional railway network of the Brazilian national railway system 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. It connects with our EFVM railroad near the cities of Belo Horizonte, in the state of Minas Gerais, and Vitória, in the state of Espírito Santo. FCA operates on the same track gauge as our EFVM railroad and provides access to the port of Santos, in the state of São Paulo. In 2013, the FCA railroad transported a total of 13.92 billion ntk of cargo, essentially all of it for customers. In 2013, FCA had a fleet of 891 locomotives and 16,744 wagons, including owned and leased.

*Ferrovia Norte-Sul railroad* ("*FNS*"). FNS is a wholly-owned subsidiary of VLI, which has a 30-year renewable subconcession for the commercial operation of a 724-kilometer stretch of the FNS railroad in Brazil. Since 1989, we have operated a segment of FNS, which connects to the EFC railroad, enabling access to the port of Itaqui, in São Luís, where our Ponta da Madeira maritime terminal is located. A 452-kilometer extension was concluded in December 2008. In 2013, the FNS railroad transported a total of 2.46 billion ntk of cargo for customers. This new railroad 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. In 2013, FNS had a fleet of 41 locomotives and 639 wagons, including owned and leased.

*MRS Logística S.A.* ("*MRS*"). The MRS railroad is 1,643 kilometers long and links the Brazilian states of Rio de Janeiro, São Paulo and Minas Gerais. In 2013, the MRS railroad carried a total of 156.1 million metric tons of cargo, including 68.4 million metric tons of iron ore and other cargo from Vale.

*Africa*

We are developing the Nacala Corridor, which will connect the Moatize site to the Nacala-à-Velha maritime terminal, located in Nacala, Mozambique, and which crosses into the Republic of Malawi. The Nacala Corridor consists of railway and port infrastructure, including greenfield and existing railways in Mozambique and Malawi and a new coal port in Mozambique. These projects will allow for the expansion of Moatize and support our operations in Central and Eastern Africa. In Mozambique, we are developing the greenfield projects under two concession agreements held by our subsidiary Corredor Logístico Integrado de Nacala S.A. ("CLN"), which will expire in 2043, subject to renewal, and we will rehabilitate existing railroads under a concession held by our subsidiary Corredor de Desenvolvimento do Norte S.A. ("CDN"), which will expire in 2035. In Malawi, we are developing a greenfield railroad under a concession held by our subsidiary Vale Logistics Limited ("VLL"), which will expire in 2041, subject to renewal, and we will rehabilitate existing railroads under a concession held by our subsidiary Central East African Railway Company Limited ("CEAR"), which was extended in 2013 for a 30-year period from the commencement of rail services under VLL's greenfield railway concession. We will also invest in the construction of railway links from Moatize to a new deep water maritime terminal to be built in Nacala-à-Velha by CLN. We continue to consider partnerships for the utilization and potential future development of the Nacala Corridor.

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**4.1.2 Ports and maritime terminals**

*Brazil*

We operate a port 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 *Bulk materials Iron ore pellets Operations*. We also use our port and terminals to handle customers' cargo. In 2013, 1.2% of the cargo handled by our port and terminals represented cargo handled for customers.

*Tubarão Port.* The Tubarão Port, which covers an area of 18 square kilometers, is located near the Vitória Port in the Brazilian state of Espírito Santo and contains the iron ore maritime terminal, which we operate directly, and the Praia Mole Terminal and the Terminal de Produtos Diversos, which are operated by VLI.

The iron ore maritime terminal has two piers. 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 200,000 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. In 2013, 101.6 million metric tons of iron ore and iron ore pellets were shipped through the terminal for us. The iron ore maritime terminal has a storage yard with a capacity of 3.4 million metric tons.

Praia Mole terminal is principally a coal terminal and handled 9.8 million metric tons in 2013.

Terminal de Produtos Diversos handled 7.4 million metric tons of grains and fertilizers in 2013.

*Ponta da Madeira maritime terminal.* Our Ponta da Madeira maritime terminal is located near the port of Itaqui, 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 tons per hour. Pier II can accommodate vessels of up to 155,000 DWT and has a maximum loading rate of 8,000 tons per hour. Pier III, which has two berths and three shiploaders, can accommodate vessels of up to 200,000 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 tons per hour. Cargo shipped through our Ponta da Madeira maritime terminal consists principally of our own iron ore production, with the exception of Pier II, which is used for general cargo. Other cargo includes manganese ore produced by us and pig iron and soybeans for unrelated parties. In 2013, 107 million metric tons of iron ore were handled through the terminal. The Ponta da Madeira maritime terminal has a storage yard with a static capacity of 8.9 million tons, which will be expanded to 10.7 million tons.

*Itaguaí maritime terminal Cia.* Portuária Baía de Sepetiba ("CPBS"). CPBS is a wholly-owned subsidiary that operates the Itaguaí terminal, in the Sepetiba Port, in the Brazilian state of Rio de Janeiro. Itaguaí's maritime terminal has a pier with one berth that allows the loading of ships up to 18 meters of draft and approximately 200,000 DWT of capacity. In 2013, the terminal uploaded 21.9 million metric tons of iron ore.

*Guaíba Island maritime terminal.* 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 2013, the terminal uploaded 39.9 million metric tons of iron ore.

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*Inácio Barbosa maritime terminal* ("TMIB"). Vale operates the Inácio Barbosa maritime terminal, located in the Brazilian state of Sergipe. The terminal is owned by Petrobras. Vale and Petrobras are parties to a service agreement that provides for the operation of this terminal by Vale until June 2014. VLI and Petrobras have entered into a consortium agreement that provides for the operation of TMIB by VLI for a 25-year period beginning after all governmental approvals are received. This consortium agreement has been approved by both CADE and the National Agency of Waterway Transportation ("ANTAQ") and is still subject to approval by the Brazilian Secretary of Ports ("SEP").

*Santos maritime terminal* ("TIPLAM"). VLI operates a maritime terminal in Santos, in the Brazilian state of São Paulo. The terminal has a pier that is equipped to receive ships of up to 67,000 DWT. In 2013, the terminal handled 2.3 million metric tons of ammonia and bulk solids.

*Argentina*

Vale Logística Argentina S.A. ("Vale Logística Argentina") operates a terminal at the San Nicolas port located in the province of Buenos Aires, Argentina, where Vale Logística Argentina has a permit to use a storage yard covering 20,000 square meters until October 2016 and an agreement with third parties for an extra storage yard of 27,000 square meters. We handled 1.17 million metric tons of iron and manganese ore through this port in 2013, which came from Corumbá, Brazil, via the Paraguay and Paraná rivers, for shipment to Brazilian, Asian and European markets. The loading rate of this port is 15,000 tons per day and the unloading rate is 11,000 tons per day.

*Oman*

Vale Oman Distribuition Center LLC ("VODC") operates a distribution center in Liwa, Sultanate of Oman. The maritime terminal has a 1.4 kilometer deep water jetty, which is integrated with a storage yard that has a throughput capacity to handle 40 Mtpy of iron ore and pellets per year. The loading nominal capacity is 10,000 tons per hour and the unloading nominal capacity is 9,000 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 6,000 DWT: a barge slip for barges with capacity of up to 4,000 DWT 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 2,000 DWT, totaling capacity of 22,000 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 55,000 DWT can unload at a rate of 10,000 tons per day and a general cargo wharf where vessels up to 215m long can berth. The general cargo wharf can move containers at a rate of 10 per hour and liquid fuels (LPG, HFO, Diesel) at a rate of 600 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 800 units. A bulk storage yard is linked to the port by a conveyor and has a storage capacity of 90,000 tons of limestone, 95,000 tons of sulfur, and 60,000 tons of coal.

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**4.1.3 Shipping**

We continue to develop and operate a low-cost fleet of vessels, comprised of our own ships and ships hired pursuant to medium and long-term contracts, to support our bulk materials business. At the end of 2013, 29 of our vessels were in operation, including 15 Valemax vessels, with a capacity of 400,000 DWT each, and 14 other vessels (capesizes, ore carriers and very large ore carriers) with capacities ranging from150,000 to 250,000 DWT. We also leased 16 Valemax vessels under long-term contracts. We expect the delivery of four more owned Valemax vessels from Chinese shipyard in 2014. To support our iron ore delivery strategy, Vale owns and operates two floating transfer stations in Subic Bay, Philippines that transfer iron ore from Valemax vessels to smaller vessels that deliver the cargo to its destinations. We expect this service to enhance our ability to offer our iron ore products in the Asian market at competitive prices and to increase our market share in China and the global seaborne market. In 2013, we shipped approximately 135 million metric tons of iron ore and pellets on a CFR basis.

In the Paraná and Paraguay waterway system, we transport iron ore and manganese ores through our subsidiary Transbarge Navegación, which transported 2.09 million tons through the waterway system in 2013, and our subsidiary Vale Logística Argentina, which loaded 1.17 million tons of ore at San Nicolas port into ocean-going vessels in 2013. In 2010, we also purchased two new convoys (two pushers and 32 barges) that will begin operations in 2014.

We operate a fleet of 24 tug boats in maritime terminals in Brazil, specifically in Vitória (in the state of Espírito Santo), Trombetas and Vila do Conde (in the state of Pará), São Luís (in the state of Maranhão), Mangaratiba (in the state of Rio de Janeiro) and Aracaju (in the state of Sergipe).

**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 2013, our installed capacity in Brazil was 1.2 GW. We use the electricity produced by these plants for our internal consumption needs. We currently have stakes in nine hydroelectric power plants and four small hydroelectric power plants in operation. The hydroelectric power plants of Igarapava, Porto Estrela, Funil, Candonga, Aimorés, Capim Branco I, Capim Branco II and Machadinho are located in the Southeastern and Southern regions, and Estreito is located in the Northern region. Once the transactions we have undertaken with CEMIG GT are complete, the joint venture Aliança Geração will hold our and CEMIG GT's interests in the following hydroelectric power plants: Porto Estrela, Igarapava, Funil, Capim Branco I e II, Aimorés and Candonga. See *Business Overview Significant changes in our business Restructuring our investments in power generation*.

We currently have a 9% stake in Norte Energia, the company established to develop and operate the Belo Monte hydroelectric plant in the Brazilian state of Pará. Upon completion of the transactions we entered into with CEMIG GT, we will indirectly hold a 4.59% stake in Norte Energia through Aliança Norte Energia. 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. This power purchase agreement will not be affected by the transactions described in *Business Overview Significant changes in our business Restructuring our investments in power generation*.

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We also produce palm oil in the Brazilian state of Pará, which will be used to produce biodiesel. The biodiesel will be blended with regular diesel to produce a fuel called B20 (with 20% of biodiesel), which will be used to power our fleet of locomotives, trucks and heavy-duty machinery in the Northern System operations.

*Canada*

In 2013, our wholly-owned and operated hydroelectric power plants in Sudbury generated 20% of the electricity requirements of our Sudbury operations. The power plants consist of five separate generation stations with an installed generator nameplate capacity of 56 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 2013, average demand for electrical energy was 197 MW to all surface plants and mines in the Sudbury area.

In 2013, diesel generation provided 100% of the electric requirements of our Voisey's Bay operations. We have six diesel generators on-site, of which normally only four are in operation, producing 12 MW.

*Indonesia*

Energy costs are a significant component of our nickel production costs for the processing of lateritic and saprolitic ores at 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 $CO_2$ emissions by replacing non-renewable power generation, and enable us to increase our current nickel production capacity in Indonesia.

**5. Other investments**

We own a 50.0% stake in California Steel Industries, Inc. ("CSI"), a producer of flat-rolled steel and pipe products located in the United States. The remainder is owned by JFE Steel. CSI's annual production capacity is approximately 2.8 million metric tons of flat rolled steel and pipe. In addition, we have a 26.9% stake in the ThyssenKrupp Companhia Siderúrgica do Atlântico ("TKCSA") integrated steel slab plant in the Brazilian state of Rio de Janeiro. The plant started operations in 2010, and produced 3.6 Mt in 2013. The plant will ultimately have a production capacity of 5.0 Mtpy and will consume 8.5 million metric tons of iron ore and iron ore pellets per year, supplied exclusively by Vale. We are also involved in two other steel projects in Brazil: Companhia Siderúrgica do Pecém ("CSP"), which is currently under construction, and Aços Laminados do Pará ("Alpa"), which is under review pending discussions with the Brazilian government.

We own minority interests in two bauxite mining businesses that are both located in Brazil: Mineração Rio do Norte S.A. ("MRN") and Mineração Paragominas S.A. ("Paragominas"). We have agreed to transfer our interests in Paragominas to Hydro in two equal tranches in 2014 and 2016.

We also have an onshore and offshore hydrocarbon exploration portfolio in Brazil and Peru. This portfolio is under review, and some concessions are being relinquished while others are in the process of being assigned, subject to regulatory approvals.

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## 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, unless otherwise stated, and calculated 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 (a) 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 (b) 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 2013, we performed an analysis of our reserve estimates for certain projects and operations, which is reflected in new estimates as of December 31, 2013. Reserve estimates for each operation assume that we either have or expect to obtain all of the necessary rights and permits to mine, extract and process ore reserves at each mine. For some of our operations, the projected exhaustion date includes stockpile reclamation that occurs after mining has ceased. Where we own less than 100% of the operation, reserve estimates have not been adjusted to reflect our 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 *Risk factors*.

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Our reserve estimates are based on certain assumptions about future prices. We have determined that our reported reserves could be economically produced if future prices for the products identified in the following table were equal to the three-year average historical prices through December 31, 2013. For this purpose, we used the three-year historical average prices set forth in the following table.

| Commodity | Three-year average historical price (US$ per metric ton, unless otherwise stated) | Pricing source |
|---|---|---|
| *Iron ore:* | | |
| Vale(1) | 144.87 | Average Platts IODEX (62% Fe CFR China, US$/dmt) |
| Samarco(2) 147 | 166.29 | Average realized price for pellets (US$/dmt) |
| *Coal:* | | |
| Metallurgical Moatize | 187.00 | Medium volatile hard coking coal FOB Queensland (source: Platts) |
| Metallurgical Integra underground | 143.65 | Average realized semi hard coking coal price |
| Metallurgical Integra open cut | 124.98 | Average semi soft coking coal realized price |
| Metallurgical Carborough Downs | 188.20 | Average hard coking coal realized price |
| Metallurgical Isaac Plains | 150.08 | Average semi hard coking coal realized price |
| PCI Carborough Downs | 156.16 | Average PCI realized price |
| PCI Isaac Plains(3) | 141.99 | Average PCI realized price |
| Thermal Integra open cut | 101.00 | Average thermal realized price |
| Thermal Isaac Plains | 93.77 | Average thermal realized price |
| *Base metals:* | | |
| Nickel(4) | 8.38 | LME Ni (US$/lb) |
| Copper | 3.64 | Average realized price (US$/lb) |
| *Nickel by-products:* | | |
| Platinum | 1,590.00 | Average realized price (US$/oz) |
| Palladium | 718.00 | Average realized price (US$/oz) |
| Gold | 1,543.00 | Average realized price (US$/oz) |
| Cobalt(4) | 13.75 | 99.3% low cobalt metal (US$/lb) (source: Metal Bulletin) |
| *Fertilizer nutrients:* | | |
| Phosphate | 174.00 | Average benchmark price for phosphate concentrate, FOB Morocco (source: Fertilizer Week) |
| Potash | 425 | Average benchmark price for potash, FOB Vancouver (source: Fertilizer Week) |
| *Manganese*(5): | | |
| Manganese lump ore | 203.72 | Average realized price (US$/dmt) |
| Manganese sinter feed | 179.35 | Average realized price (US$/dmt) |

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

(2) US$ per dry metric ton of iron ore pellets is used for pricing at Samarco.

(3) Both semi soft coking coal (SSCC) and PCI are considered the same product at the operation in compiling the average three yearly sales price.

(4) 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.

(5) Prices mostly on a Delivery Duty Unpaid (DDU) China basis.

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**Iron ore reserves**

The following tables set forth our iron ore reserves and other information about our iron ore mines. Total iron ore reserves increased 10% from 2012 to 2013, reflecting new reserves from the Capanema and Conta História deposits and the updated geological and reserve models to incorporate new cutoff limits and drilling data for deposits at Alegria, Fábrica Nova and Fazendão (Southeastern System). In addition, we included reserves supported by a new process to treat hard itabirites from Galinheiro and Sapecado (Southern System). Other modifications reflect depletion from 2013 operations.

**Summary of total iron ore reserves(1)**

| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| Southeastern System | 2,112.0 | 48.0 | 3,135.7 | 45.5 | 5,247.7 | 46.5 | 3,318.3 | 49.1 |
| Southern System | 2,081.2 | 45.7 | 3,518.4 | 43.6 | 5,599.6 | 44.4 | 5,435.4 | 44.8 |
| Midwestern System | 6.6 | 62.8 | 24.8 | 62.2 | 31.4 | 62.3 | 33.6 | 62.2 |
| Northern System | 4,760.5 | 66.7 | 2,423.4 | 66.6 | 7,184.0 | 66.7 | 7,278.2 | 66.7 |
| Vale Total | 8,960.3 | 57.4 | 9,102.3 | 50.5 | 18,062.7 | 53.9 | 16,065.5 | 55.6 |
| Samarco(2) | 1,867.7 | 40.1 | 1,078.4 | 38.8 | 2,946.1 | 39.7 | 2,976.5 | 39.7 |
| Total | 10,828.0 | 54.4 | 10,180.7 | 49.2 | 21,008.8 | 51.9 | 19,042.0 | 53.1 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture contents: Southeastern System 4.1%; Southern System 4.2%; Midwestern System 5.9%; Northern System 6.0%; and Samarco 6.5%. Grade is % of Fe.

(2) Reserves of Samarco's Alegria iron ore mines. Our equity interest in Samarco is 50.0% and the reserve figures have not been adjusted to reflect our ownership interest.

**Iron ore reserves per mine in the Southeastern System(1)**

| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Itabira site* | | | | | | | | |
| Conceição | 482.4 | 45.8 | 102.4 | 47.7 | 584.8 | 46.1 | 607.5 | 46.3 |
| Minas do Meio | 202.7 | 51.5 | 69.8 | 48.8 | 272.6 | 50.8 | 295.7 | 50.8 |
| *Minas Centrais site* | | | | | | | | |
| Água Limpa(2) | 20.3 | 42.0 | 6.7 | 42.7 | 27.0 | 42.2 | 33.0 | 42.2 |
| Brucutu | 210.1 | 50.4 | 260.3 | 48.3 | 470.3 | 49.3 | 501.4 | 49.5 |
| Apolo | 292.4 | 57.4 | 339.7 | 55.1 | 632.1 | 56.1 | 632.1 | 56.1 |
| *Mariana site* | | | | | | | | |
| Alegria | 213.3 | 46.3 | 143.5 | 44.0 | 356.8 | 45.4 | 157.8 | 48.3 |
| Fábrica Nova | 379.2 | 43.6 | 779.1 | 40.9 | 1,158.3 | 41.8 | 770.9 | 44.7 |
| Fazendão | 311.6 | 45.7 | 307.6 | 40.7 | 619.2 | 43.2 | 319.8 | 49.9 |
| Capanema | | | 610.7 | 47.1 | 610.7 | 47.1 | | |
| Conta História | | | 515.9 | 45.4 | 515.9 | 45.4 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Southeastern System | 2,112.0 | 48.0 | 3,135.7 | 45.5 | 5,247.7 | 46.5 | 3,318.3 | 49.1 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture contents: Itabira site 1.5%; Minas Centrais site 6.8%; Mariana site 3.9%. Grade is % of Fe. Approximate drill hole spacings used to classify the reserves were: 100m × 100m to proven reserves and 200m × 200m to probable reserves.

(2) Vale's equity interest in Água Limpa is 50.0% and the reserve figures have not been adjusted to reflect our ownership interest.

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**Iron ore reserves per mine in the Southern System(1)**

| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Minas Itabiritos site* | | | | | | | | |
| Segredo | 147.6 | 51.6 | 98.0 | 44.3 | 245.5 | 48.7 | 249.2 | 48.8 |
| João Pereira | 648.5 | 41.0 | 338.2 | 40.8 | 986.7 | 40.9 | 1,011.2 | 41.1 |
| Sapecado | 345.1 | 45.1 | 261.5 | 42.6 | 606.6 | 44.0 | 550.0 | 44.8 |
| Galinheiro | 260.9 | 45.6 | 892.8 | 43.5 | 1,153.8 | 44.0 | 973.6 | 44.7 |
| *Vargem Grande site* | | | | | | | | |
| Tamanduá | 52.7 | 59.9 | 350.0 | 47.5 | 402.8 | 49.2 | 412.3 | 49.4 |
| Capitão do Mato | 229.1 | 51.2 | 957.4 | 45.3 | 1,186.5 | 46.5 | 1,198.1 | 46.7 |
| Abóboras | 314.9 | 41.8 | 602.3 | 40.1 | 917.1 | 40.7 | 924.6 | 40.8 |
| *Paraopeba site* | | | | | | | | |
| Jangada | 23.0 | 66.7 | 12.7 | 66.4 | 35.7 | 66.6 | 43.1 | 66.6 |
| Capão Xavier | 59.4 | 65.0 | 5.5. | 64.1 | 64.9 | 65.0 | 73.3 | 65.0 |
| Total Southern System | 2,081.2 | 45.7 | 3,518.4 | 43.6 | 5,599.6 | 44.4 | 5,435.4 | 44.8 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine. Grade is % of Fe, based on the following moisture contents: Minas Itabiritos site 5.1%; Vargem Grande site 3.2%; Paraopeba site 3.7%. Approximate drill hole spacings used to classify the reserves were: 100m × 100m to proven reserves and 200m × 200m to probable reserves.

**Iron ore reserves per mine in the Midwestern System(1)(2)(3)**

| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| Urucum | 6.6 | 62.8 | 24.8 | 62.2 | 31.4 | 62.3 | 33.6 | 62.2 |
| Total Midwestern System | 6.6 | 62.8 | 24.8 | 62.2 | 31.4 | 62.3 | 33.6 | 62.2 |

(1) The Midwestern System is comprised of the Urucum and Corumbá mines.

(2) We are conducting a review of Corumbá's reserve estimate, which we expect to disclose in the next cycle.

(3) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture contents: 5.9%. Grade is % of Fe. Approximate drill hole spacings used to classify the reserves were: 70m × 70m to proven reserves and 140m × 140m to probable reserves.

**Iron ore reserves per mine in the Northern System(1)**

| Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|

| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
|---|---|---|---|---|---|---|---|---|
| *Serra Norte site* | | | | | | | | |
| N4W | 1,099.6 | 66.5 | 275.1 | 66.1 | 1,374.7 | 66.5 | 1,405.5 | 66.5 |
| N4E | 240.8 | 66.5 | 84.4 | 66.0 | 325.2 | 66.4 | 345.1 | 66.4 |
| N5 | 231.3 | 67.0 | 705.8 | 67.3 | 937.1 | 67.2 | 980.6 | 67.2 |
| *Serra Sul* | | | | | | | | |
| S11 | 3,045.8 | 66.8 | 1,193.7 | 66.7 | 4,239.6 | 66.7 | 4,239.6 | 66.7 |
| *Serra Leste* | | | | | | | | |
| SL1 | 143.0 | 65.7 | 164.4 | 65.1 | 307.4 | 65.4 | 307.4 | 65.4 |
| Total Northern System | 4,760.5 | 66.7 | 2,423.4 | 66.6 | 7,184.0 | 66.7 | 7,278.2 | 66.7 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture contents: Serra Norte 8.3%; Serra Sul 4.6%; Serra Leste 4.3%. Grade is % of Fe. Approximate drill hole spacings used to classify the reserves were: 150m × 100m to proven reserves and 300m × 200m to probable reserves, except SL1 which is 100m × 100m to proven reserves and 200m × 200m to probable reserves.

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**Iron ore reserves per Samarco(1)(2)**

| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Samarco* | | | | | | | | |
| Alegria Norte/Centro | 1,058.1 | 42.0 | 704.2 | 40.2 | 1,762.3 | 41.3 | 1,780.5 | 41.4 |
| Alegria Sul | 750.8 | 37.6 | 352.8 | 36.1 | 1,103.6 | 37.1 | 1,115.8 | 37.1 |
| Germano | 58.8 | 39.7 | 21.4 | 39.8 | 80.2 | 39.8 | 80.2 | 39.8 |
| Total Samarco | 1,867.7 | 40.1 | 1,078.4 | 38.8 | 2,946.1 | 39.7 | 2,976.5 | 39.7 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine based on moisture content of 6.5%. Grade is % of Fe. Approximate drill hole spacings used to classify the reserves were: Alegria Norte/Centro, 150m × 100m to proven reserves and 300m × 200m to probable reserves; Alegria Sul, 100m × 100m to proven reserves and 200m × 200m to probable reserves.

(2) Vale's equity interest in Samarco mines is 50.0% and the reserve figures have not been adjusted to reflect our ownership interest.

**Southeastern System iron ore mines**

| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
|---|---|---|---|---|
| *Itabira site* | | | | |
| Conceição | Open pit | 1957 | 2025 | 100.0 |
| Minas do Meio | Open pit | 1976 | 2022 | 100.0 |
| *Minas Centrais site* | | | | |
| Água Limpa | Open pit | 2000 | 2016 | 50.0 |
| Brucutu | Open pit | 1994 | 2023 | 100.0 |
| Apolo | Open pit | | 2038 | 100.0 |
| *Mariana site* | | | | |
| Alegria | Open pit | 2000 | 2033 | 100.0 |
| Fábrica Nova | Open pit | 2005 | 2040 | 100.0 |
| Fazendão | Open pit | 1976 | 2048 | 100.0 |
| Capanema | Open pit | | 2057 | 100.0 |
| Conta História | Open pit | | 2052 | 100.0 |

**Southern System iron ore mines**

| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
|---|---|---|---|---|
| *Minas Itabiritos site* | | | | |
| Segredo | Open pit | 2003 | 2047 | 100.0 |
| João Pereira | Open pit | 2003 | 2046 | 100.0 |
| Sapecado | Open pit | 1942 | 2047 | 100.0 |
| Galinheiro | Open pit | 1942 | 2047 | 100.0 |
| *Vargem Grande site* | | | | |
| Tamandu | Open pit | 1993 | 2038 | 100.0 |
| Capitão do Mato | Open pit | 1997 | 2058 | 100.0 |
| Abóboras | Open pit | 2004 | 2050 | 100.0 |
| *Paraopeba site* | | | | |
| Jangada | Open pit | 2001 | 2018 | 100.0 |
| Capão Xavier | Open pit | 2004 | 2018 | 100.0 |

| | Midwestern System iron ore mines | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| Urucum | Open pit | 1994 | 2029 | 100.0 |

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| Northern System iron ore mines | | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Serra Norte* | | | | |
| N4W | Open pit | 1994 | 2032 | 100.0 |
| N4E | Open pit | 1984 | 2028 | 100.0 |
| N5 | Open pit | 1998 | 2035 | 100.0 |
| *Serra Sul* | | | | |
| S11 | Open pit | | 2064 | 100.0 |
| *Serra Leste* | | | | |
| SL1 | Open pit | | 2065 | 100.0 |

| Samarco iron ore mines | | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Samarco* | | | | |
| Alegria Norte/Centro | Open pit | 2000 | 2053 | 50.0 |
| Alegria Sul | Open pit | 2000 | 2053 | 50.0 |
| Germano | Open pit | | 2037 | 50.0 |

**Manganese ore reserves**

The following tables set forth manganese reserves and other information about our mines. Total manganese reserves increased 2% from 2012 to 2013. This increase in Urucum's reserves in 2013 reflects an updated geological model to incorporate new drilling data and an additional seam.

| Manganese ore reserves(1)(2) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| Azul | 30.1 | 40.3 | 7.8 | 39.5 | 37.9 | 40.1 | 42.0 | 40.2 |
| Urucum | 9.8 | 46.2 | 1.8 | 46.5 | 11.6 | 46.3 | 5.9 | 45.1 |
| Morro da Mina | 8.7 | 25.3 | 5.7 | 24.8 | 14.4 | 25.1 | 14.6 | 25.1 |
| Total | 48.6 | 38.8 | 15.3 | 34.9 | 63.9 | 37.9 | 62.5 | 37.1 |

(1) Tonnage is stated in millions of metric tons of wet run-of-mine. Grade is % of Mn.

(2) The average moisture of the manganese ore reserves is: Azul (16.2%), Urucum (4.2%), Morro da Mina (3.4%).

| Manganese ore mines | | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| Azul | Open pit | 1985 | 2022 | 100.0 |
| Urucum | Underground | 1976 | 2026 | 100.0 |
| Morro da Mina | Open pit | 1902 | 2053 | 100.0 |

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**Coal reserves**

Our coal reserve estimates have been provided on an in-place material basis after adjustments for depletion, moisture content, anticipated mining losses and dilution, but excluding any adjustment for losses associated with beneficiation of raw coal mined to meet saleable product requirements.

| | | Coal ore reserves(1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | ROM(2) | | | | | | Marketable Reserves(3) | |
| | Coal type | Proven 2013 | Probable 2013 | Total | 2013 (calorific value) | Total | 2012 (calorific value) | 2013 | 2012 |
| | | (tonnage) | | (tonnage) | | (tonnage) | | (tonnage) | (tonnage) |
| Integra Coal: | | | | | | | | | |
| Integra Open-cut | Metallurgical & thermal | 14.9 | 4.5 | 19.4 | 29.7 (thermal) | 21 | 30.1 | 10.1 | 10.9 |
| Integra Underground Middle Liddell Seam | Metallurgical | 0.6 | 6.3 | 6.9 | | 8.7 | | 4.7 | 5.7 |
| Integra Underground Hebden Seam | Metallurgical | 0.0 | 29.5 | 29.5 | | 30.8 | | 20.6 | 2.8 |
| Total Integra Coal | | 15.5 | 40.3 | 55.8 | | 60.5 | | 35.4 | 19.4 |
| Carborough Downs Underground(4) | Metallurgical & PCI | 24.0 | 2.8 | 26.8 | 31.2 (PCI) | 27.5 | 31.2 (PCI) | 17.4 | 18.9 |
| Isaac Plains North Open Cut | Metallurgical, PCI & thermal | 10.7 | 0.1 | 10.8 | 30.1 (PCI) 28.3 (thermal) | 15.5 | 30.1 (PCI) 28.3 (thermal) | 8.2 | 11.9 |
| Moatize | Metallurgical & thermal l | 288.8 | 1,148.2 | 1,437.0 | | 1,498.6 | 25.9 | 515.0 | 537.1 |
| Total | | 339 | 1,191.4 | 1,530.4 | | 1,602.1 | | 576.0 | 605.3 |

(1) The reserves stated above by deposit are on a 100% shareholding basis. Vale's ownership interest in accordance with the table below should be used to calculate the portion of reserves directly attributable to Vale.

(2) Tonnage is stated in millions of metric tons. Reserves are reported on a variable basis in regard to moisture: Integra Open Cut on ROM estimated basis, Integra Underground on ROM estimated basis, Carborough Downs on air dried basis, and Isaac Plains North on ROM estimated basis + 2%.Moatize is reported on in situ 6.5% moisture basis. Calorific value of product coal derived from beneficiation of ROM coal is typically stated in MJ/kg. Calorific value is used in marketing thermal and PCI coals.

(3) Tonnage is stated in millions of metric tons.

(4) In calculating reserves, gas drainage is assumed to have been completed in accordance with the mine plan. Reduced reserves reflect the omission of certain blocks and related development as a result of adverse economic conditions.

Reserves at Integra Open Cut, the Middle Liddell Seam for Integra Underground, Carborough Downs and Isaac Plains decreased in 2013 mainly due to depletion. Reserves for the Hebden Seam for Integra Underground decreased slightly following an update to the reserve model. Total Moatize ROM reserves decreased 4.1% from 2012 to 2013 reflecting depletion and adjustments due to the revised land use license

agreement.

| Coal mines | | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| Integra Coal: | | | | |
| Open-cut | Open pit | 1991 | 2021 | 61.2 |
| Middle Liddell Seam | Underground | 1999 | 2016 | 61.2 |
| Hebden Seam | Underground | | 2031 | 61.2 |
| Carborough Downs | Underground | 2006 | 2020 | 85.0 |
| Isaac Plains | Open pit | 2006 | 2017 | 50.0 |
| Moatize | Open pit | 2011 | 2042 | 95.0 |

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**Nickel ore reserves**

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

| | Nickel ore reserves(1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Canada* | | | | | | | | |
| Sudbury | 52.4 | 1.26 | 49.0 | 1.23 | 101.4 | 1.25 | 97.9 | 1.16 |
| Thompson | 3.9 | 2.03 | 20.0 | 1.70 | 23.9 | 1.75 | 25.6 | 1.74 |
| Voisey's Bay | 14.0 | 2.77 | 3.2 | 0.67 | 17.2 | 2.38 | 19.5 | 2.43 |
| *Indonesia* | | | | | | | | |
| PTVI | 94.2 | 1.81 | 33.3 | 1.74 | 127.5 | 1.79 | 104.8 | 1.78 |
| *New Caledonia* | | | | | | | | |
| VNC | 57.2 | 1.34 | 67.0 | 1.49 | 124.2 | 1.42 | 122.5 | 1.44 |
| *Brazil* | | | | | | | | |
| Onça Puma | 57.3 | 1.74 | 38.1 | 1.41 | 95.3 | 1.61 | 82.4 | 1.52 |
| Total | 279.0 | 1.65 | 210.6 | 1.46 | 489.5 | 1.57 | 452.7 | 1.53 |

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

In Canada, reserves at our Sudbury operations increased due primarily to mineral reserve additions at Copper Cliff Mine, specifically from Kelly Lake and 178 orebodies. Reserves at our Thompson and Voisey's Bay operations decreased due to depletions. Mineral reserves at PTVI increased mainly due to the addition of new block reserves, which was partially offset by losses caused by depletion, pit designs and updates to ore block models. Mineral reserves at VNC increased slightly due to the conversion of mineral resources to mineral reserves in the north portion of the Goro Plateau. Reserves at Onça Puma increased due to mine optimization work, including a new mine dilution strategy.

| | Nickel ore mines | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Canada* | | | | |
| Sudbury | Underground | 1885 | 2039 | 100.0 |
| Thompson | Underground | 1961 | 2033 | 100.0 |
| Voisey's Bay | Open pit | 2005 | 2022 | 100.0 |
| *Indonesia* | | | | |
| PTVI | Open pit | 1977 | 2035 | 59.3 |
| *New Caledonia* | | | | |
| VNC | Open pit | 2011 | 2043 | 80.5 |
| *Brazil* | | | | |
| Onça Puma | Open pit | 2011 | 2054 | 100.0 |

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**Copper ore reserves**

Our copper 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) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Canada* | | | | | | | | |
| Sudbury | 52.4 | 1.70 | 49.0 | 1.32 | 101.4 | 1.51 | 97.9 | 1.48 |
| Voisey's Bay | 14.0 | 1.56 | 3.2 | 0.37 | 17.2 | 1.34 | 19.5 | 1.36 |
| *Brazil* | | | | | | | | |
| Sossego | 121.7 | 0.78 | 15.8 | 0.70 | 137.5 | 0.77 | 150.7 | 0.79 |
| Salobo | 641.6 | 0.76 | 494.8 | 0.64 | 1,136.4 | 0.71 | 1,122.6 | 0.72 |
| Total | 829.7 | 0.84 | 562.8 | 0.70 | 1,392.5 | 0.78 | 1,390.7 | 0.79 |

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

In Canada, our copper ore reserve estimates at our Sudbury operations increased. At our Voisey's Bay operations, reserves decreased for the same reasons discussed above in connection with the nickel reserves. This is because these deposits are polymetallic. In Brazil, reserves at Sossego decreased compared to 2012 due to mine depletions. The increase of reserves at Salobo is due to cutoff grade changes and an improved pit design.

| | Copper ore mines | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Canada* | | | | |
| Sudbury | Underground | 1885 | 2039 | 100.0 |
| Voisey's Bay | Open pit | 2005 | 2022 | 100.0 |
| *Brazil* | | | | |
| Sossego | Open pit | 2004 | 2024 | 100.0 |
| Salobo | Open pit | 2012 | 2065 | 100.0 |

**PGMs and other precious metals reserves**

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

| | Precious metals reserves(1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Canada* | | | | | | | | |
| Sudbury | | | | | | | | |
| Platinum | 52.4 | 0.8 | 49.0 | 1.1 | 101.4 | 0.9 | 97.9 | 0.8 |
| Palladium | 52.4 | 1.0 | 49.0 | 1.3 | 101.4 | 1.1 | 97.9 | 1.0 |
| Gold | 52.4 | 0.4 | 49.0 | 0.4 | 101.4 | 0.4 | 97.9 | 0.4 |
| *Brazil* | | | | | | | | |
| Sossego | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Gold | 121.7 | 0.2 | 15.8 | 0.2 | 137.5 | 0.2 | 150.68 | 0.2 |
| Salobo | | | | | | | | |
| Gold | 641.6 | 0.4 | 494.8 | 0.3 | 1,136.4 | 0.4 | 1,122.6 | 0.4 |
| Total Gold | 920.5 | 0.4 | 657.6 | 0.4 | 1,578.1 | 0.5 | 1,567.0 | 0.4 |

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

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In Sudbury our mineral reserve estimates for platinum, palladium and gold increased for the reasons discussed above in connection with the nickel reserves. In Brazil, reserves at Sossego decreased from last year due to mine depletions. The increase of reserves at Salobo is due to cutoff grade changes and an improved pit design.

| | Precious metals mines | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Canada* | | | | |
| Sudbury | Underground | 1885 | 2039 | 100.0 |
| *Brazil* | | | | |
| Sossego | Open pit | 2004 | 2024 | 100.0 |
| Salobo | Open pit | 2012 | 2065 | 100.0 |

**Cobalt ore reserves**

We expect to recover significant quantities of cobalt as a by-product of our Canadian operations and from the VNC project. Our cobalt reserve estimates are of in-place material after adjustments for depletion and mining losses (or screening in the case of VNC) and recoveries, with no adjustments made for metal losses due to processing.

| | Cobalt ore reserves(1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| *Canada* | | | | | | | | |
| Sudbury | 52.4 | 0.04 | 49.0 | 0.04 | 101.4 | 0.04 | 97.9 | 0.04 |
| Voisey's Bay | 14.0 | 0.13 | 3.2 | 0.03 | 17.2 | 0.11 | 19.5 | 0.12 |
| *New Caledonia* | | | | | | | | |
| VNC | 57.2 | 0.12 | 67.0 | 0.11 | 124.2 | 0.11 | 122.5 | 0.11 |
| Total | 123.6 | 0.09 | 119.2 | 0.08 | 242.8 | 0.08 | 239.9 | 0.08 |

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

Our cobalt reserve estimates increased in 2013 for the reasons discussed above in connection with the nickel reserves.

| | Cobalt ore mines | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| *Canada* | | | | |
| Sudbury | Underground | 1885 | 2039 | 100.0 |
| Voisey's Bay | Open pit | 2005 | 2022 | 100.0 |
| *New Caledonia* | | | | |
| VNC | Open pit | 2011 | 2043 | 80.5 |

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**Phosphate reserves**

Our phosphate reserve estimates reflect mine production and sales in 2013. Reserves at Bayovar increased by 84% due to the inclusion of two additional phosphate seams in the mining plan and a new mining strategy that uses a higher dilution in order to maximize recovery. Our phosphate reserves estimates are of in-place material after adjustments for mining dilution.

| | Phosphate reserves(1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| Bayóvar | 166.0 | 16.3 | 249.9 | 14.9 | 415.9 | 15.5 | 225.4 | 17.2 |
| Catalão | 44.5 | 10.5 | 8.3 | 10.2 | 52.8 | 10.4 | 57.9 | 10.6 |
| Tapira | 235.6 | 7.1 | 445.4 | 6.7 | 680.9 | 6.8 | 691.2 | 6.8 |
| Araxá(2) | 89.2 | 12.0 | 42.8 | 11.0 | 132.1 | 11.7 | 138.6 | 11.6 |
| Cajati | 68.0 | 5.6 | 46.4 | 4.7 | 114.4 | 5.2 | 120.0 | 5.2 |
| Salitre | | | 205.7 | 11.4 | 205.7 | 11.4 | 205.7 | 11.4 |
| Total | 603.3 | 10.4 | 998.5 | 9.8 | 1601.8 | 10.1 | 1438.8 | 9.58 |

(1) Tonnage is stated in millions of dry metric tons. Grade is % of $P_2O_5$.

(2) Proven reserves of secondary ore for Araxá were reclassified as probable reserves as a result of new process flowsheet development.

| | Phosphate rock ore mine | | | |
|---|---|---|---|---|
| | Type | Operating since | Projected exhaustion date | Vale interest (%) |
| Bayóvar | Open pit | 2010 | 2045 | 40.0(1) |
| Catalão | Open pit | 1982 | 2020 | 100.0 |
| Tapira | Open pit | 1979 | 2054 | 100.0 |
| Araxá | Open pit | 1977 | 2027 | 100.0 |
| Cajati | Open pit | 1970 | 2035 | 100.0 |
| Salitre | Open pit | | 2033 | 100.0 |

(1) Vale holds 51% of the voting capital and 40% of the total capital of MVM Resources International, B.V., the entity that controls Bayóvar.

**Potash ore reserves**

Our 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. Tonnage at Taquari-Vassouras increased by 32% due to a new mine design, with higher dilution to maximize ore recovery and which reduces the cutoff grade to have a higher volume of products. Our total potash reserves also increased due to the inclusion of Carnalita Project, located at Sergipe state, Brazil, which is still subject to approval of our Board of Directors.

| | Potash ore reserves(1)(2) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Proven | 2013 | Probable | 2013 | Total | 2013 | Total | 2012 |
| | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade | Tonnage | Grade |
| Taquari-Vassouras(3) | 7.8 | 26.0 | 5.1 | 21.1 | 12.9 | 24.1 | 9.8 | 28.0 |
| Carnalita Project(4) | 247.1 | 12.1 | 54.1 | 12.1 | 301.5 | 12.1 | | |

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

(2) Tonnage is before processing recovery.

(3) Silvinite potash reserves.

(4) Carnalite potash reserves.

| | Potash ore mines | | | |
|---|---|---|---|---|
| | **Type** | **Operating since** | **Projected exhaustion date** | **Vale interest (%)** |
| Taquari-Vassouras(1) | Underground | 1986 | 2018 | 100.0 |
| Carnalita Project | Solution mining | | 2042 | 100.0 |

(1) We have a 30-year lease with Petrobras, which was signed in 2012.

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## CAPITAL EXPENDITURES

We have an extensive program of investments in the organic growth of our businesses. The figures discussed in this section are for project execution and sustaining existing operations.

The 2014 investment budget approved by our Board of Directors is US$9.3 billion for project execution, reflecting a 8.2% decrease compared to the 2013 investment budget, and US$4.5 billion for sustaining existing operations, reflecting a 11.1% decrease compared to 2013. These decreases reflect stricter discipline in capital allocation, a stronger focus on maximizing efficiency and minimizing costs and a future project pipeline that is smaller, but with higher potential to generate substantial value for our shareholders.

A large part of the capital expenditure budget will be invested in Brazil (62.7%) and in Mozambique (22.2%). The remainder has been allocated to investments in Australia, Canada, China, Indonesia, Malaysia, Malawi, New Caledonia and Peru, among other countries.

| | 2012 expenditures | 2013 expenditures | 2014 budget | |
|---|---|---|---|---|
| | (US$ million) | (US$ million) | (US$ million) | (% of total) |
| Project execution | 11,580 | 9,648 | 9,299 | 67.2% |
| Investments to sustain existing operations | 4,616 | 4,585 | 4,547 | 32.8% |
| Total | US$16,196 | US$14,233 | US$13,847 | 100.0% |

The following table summarizes by major business area the breakdown of our capital expenditures in 2012 and 2013 and our investment budget for 2014.

| | 2012 | | 2013 | | 2014 budget | |
|---|---|---|---|---|---|---|
| | (US$ million) | (% of total) | (US$ million) | (% of total) | (US$ million) | (% of total) |
| Ferrous minerals | 7,882 | 48.7 | 7,150 | 50.3 | 8,313 | 60.0 |
| Coal | 1,150 | 7.1 | 1,511 | 10.6 | 2,779 | 20.1 |
| Base metals | 3,693 | 22.8 | 3,027 | 21.3 | 1,813 | 13.1 |
| Fertilizer nutrients | 1,836 | 11.3 | 1,159 | 8.1 | 452 | 3.3 |
| Logistics for general cargo(1) | 592 | 3.7 | 603 | 4.2 | - | - |
| Energy | 292 | 1.8 | 214 | 1.5 | 188 | 1.4 |
| Steel | 348 | 2.1 | 315 | 2.2 | 264 | 1.9 |
| Other | 403 | 2.5 | 254 | 1.8 | 37 | 0.3 |
| Total | US$16,196 | 100.0% | US$14,233 | 100.0% | US$13,847 | 100.0% |

(1) Investments in logistics dedicated to a particular business segment are included with that segment in our capital expenditure data. In 2014, we excluded logistics for general cargo from the total budget.

We are developing a focused organic growth portfolio, with fewer projects but with higher expected rates of return. Our main initiatives are responsible for 83% of the US$9.3 billion budgeted for project execution in 2014. These programs include:

The expansion of our top-quality integrated iron ore operations in Carajás, with 2014 budgeted expenditures in the amount of US$3.3 billion, consisting of S11D, CLN S11D, Serra Leste projects and the conclusion of Carajás plant 2 (formerly known as Additional 40 Mtpy) and CLN 150;

Construction and ramp-up of our world-class integrated Moatize/Nacala coal operation, with 2014 budgeted expenditures in the amount of US$2.6 billion;

Capacity replacement, increase and quality improvement in the iron ore from the Southern and Southeastern Systems, with 2014 budgeted expenditures in the amount of US$1.1 billion, including the Conceição Itabiritos II, Vargem Grande Itabiritos, Cauê Itabiritos projects and the conclusion of Conceição Itabiritos;

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Global distribution network of iron ore in the amount of US$436 million, including investments in the construction of the Teluk Rubiah distribution center (in the amount of US$278 million), vessels (in the amount of US$155 million) and barges (in the amount of US$3 million); and

Salobo II, with 2014 budgeted expenditures in the amount of US$332 million, which will increase our production of copper and gold.

The following table sets forth total expenditures in 2013 for our main investment projects and expenditures budgeted for those projects in 2014, together with estimated total expenditures for each project and the estimated start-up date of each project as of December 31, 2013.

| Business area | Main projects(1) | Actual or Estimated Start-up | Executed CAPEX | | Expected CAPEX | |
|---|---|---|---|---|---|---|
| | | | 2013(2) | Total | 2014 | Total(3) |
| | | | (US$ million) | | | |
| Iron ore | Carajás Plant 2(4) | 2H13 | 547 | 3,020 | 174 | 3,475 |
| | Carajás Serra Sul S11D | 2H16 | 818 | 2,631 | 1,091 | 8,089 |
| | CLN 150(4) | 2H13 | 518 | 3,778 | 69 | 3,931 |
| | CLN S11D | 1H14 to 2H18 | 696 | 1,156 | 1,914 | 11,582 |
| | Serra Leste | 2H14 | 140 | 432 | 34 | 478 |
| | Conceição Itabiritos(4) | 2H13 | 249 | 1,030 | 73 | 1,174 |
| | Vargem Grande Itabiritos | 2H14 | 376 | 1,292 | 376 | 1,910 |
| | Conceição Itabiritos II | 2H14 | 228 | 652 | 240 | 1,189 |
| | Cauê Itabiritos | 2H15 | 233 | 353 | 373 | 1,504 |
| | Teluk Rubiah | 2H14 | 490 | 1,003 | 278 | 1,371 |
| Pellet plants | Tubarão VIII | 1H14 | 194 | 1,084 | 154 | 1,321 |
| Coal mining and logistics | Moatize II | 2H15 | 383 | 839 | 761 | 2,068 |
| | Nacala Corridor | 2H14 | 932 | 1,341 | 1,812 | 4,444 |
| Copper mining | Salobo II | 1H14 | 294 | 1,054 | 332 | 1,707 |
| Nickel mining and refining | Long Harbour(5) | 1H14 | 1,030 | 4,186 | 40 | 4,250 |
| | Totten(4) | 2H13 | 172 | 712 | 47 | 759 |
| Steelmaking | CSP(6) | 2H15 | 297 | 873 | 197 | 2,570 |

(1) Projects approved by the Board of Directors.

(2) All figures presented on a cash basis.

(3) Estimated total capital expenditure cost for each project, including expenditures in prior periods.

(4) Projects delivered in 2013.

(5) We completed the construction in 2013, have initiated commissioning activities and expect to commence production in the second quarter of 2014.

(6) Expected CAPEX and funding is relative to Vale's stake in the project.

The paragraphs below describe the status of each project as of December 31, 2013 and have not been updated to reflect any developments after that date.

**Bulk materials and logistics projects**

Iron ore mining and logistics projects:

*Carajás Serra Sul S11D.* Development of a mine and processing plant, located in the southern range of Carajás, in the Brazilian state of Pará. The project has an estimated nominal capacity of 90 Mtpy. We are continuing the off-site electromechanical assembly of modules. We received the installation license in July 2013. The project is 48% complete, with total realized expenditures of US$2.6 billion. The start-up is expected in the second half of 2016.

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*CLN S11D.* Increase in the logistics capacity of the Northern System to support the S11D project, including the duplication of approximately 570 km of railway, construction of a rail spur with 101 km, acquisition of wagons and locomotives and onshore and offshore expansions at Ponta da Madeira maritime terminal. This project is expected to increase EFC's estimated nominal logistics capacity to approximately 230 Mtpy. We have obtained the environmental installation license and the authorization from ANTT for civil works required for the construction. Earthworks for railway duplication and civil works of the rail spur to connect the mine to the EFC are in progress. The project is 13% complete, with total realized expenditures of US$1.2 billion. The start-up is expected from the first half of 2014 to second half of 2018.

*Serra Leste.* Construction of a new processing plant located in Carajás, in the Brazilian state of Pará. The project has an estimated nominal capacity of 6 Mtpy. The installation license has already been issued. We have concluded eletromechanical assembly of the substation and energizing the processing plant, and we have intiated the pre-stripping and commissioning of the iron ore treatment facility. The project is 78% complete, with total realized expenditures of US$432 million. The start-up is expected in the second half of 2014.

*Vargem Grande Itabiritos.* Construction of a new iron ore treatment plant in the Southern System, with an estimated nominal additional capacity of 10 Mtpy. We are currently assembling steel structures and equipment for the iron ore beneficiation plant and conducting civil works for the long distance conveyor belt and Andaime railway terminal. We expect to receive the environmental operating license in the second half of 2014. The project is 80% complete, with total realized expenditures of US$1.3 billion. The start-up is expected in the second half of 2014.

*Conceição Itabiritos II.* Adaptation of the plant to process low-grade itabirites, located in the Southeastern System. The project has an estimated nominal capacity of 19 Mtpy, without net additional capacity. We have completed the assembly of steel structures of the flotation cells and civil works for the ball mill with feed type system. We are currently conducting civil engineering work and steel structure and equipment electromechanical assembly. The project is 79% complete, with total realized expenditures of US$652 million. The start-up is expected in the second half of 2014.

*Cauê Itabiritos.* Adaptation of the plant to process low-grade itabirites, located in the Southeastern System. The project has an estimated nominal capacity of 24 Mtpy, with net additional capacity of 4 Mtpy in 2017. We have started the electromechanical assembly of the quaternary screening and grinding. We are conducting civil works and have received the steel structure and equipment. The project is 47% complete, with total realized expenditures of US$353 million. The start-up is expected in the second half of 2015.

*Teluk Rubiah.* Construction of a distribution center in Teluk Rubiah, Malaysia, with a private jetty with enough depth to receive 400,000 DWT vessels and a storage yard. The distribution center will have a throughput of 30 Mtpy of iron ore products. The import system is already commissioned and ready to receive the first vessel. The preliminary, construction and installation environmental licenses have been issued. The operating license is expected to be issued in the first half of 2014. The project is 94% complete, with total realized expenditures of US$1.0 billion. The start-up of the integrated system (import and export systems) is expected in the second half of 2014.

Pellet plant projects:

*Tubarão VIII.* Eighth pellet plant at our existing complex at the Tubarão Port, Espírito Santo, Brazil, with expected production capacity of 7.5 Mtpy. We have performed tests with pelletizing cargo and are in the final stage of the commissioning activities. We expect to receive the operating license in the first half of 2014. The plant is 95% complete, with total realized expenditures of US$1.1 billion. The start-up is expected in the first half of 2014.

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Coal mining and logistics projects:

*Moatize II.* New pit and duplication of the Moatize coal handling processing plant (CHPP), as well as all related infrastructure, located in Tete, Mozambique. The project will increase Moatize's total nominal capacity to 22 Mtpy, mostly comprised of coking coal. We concluded earthworks and are well advanced in civil works, with concrete foundations at the primary crusher, CHPP and heavy duty vehicles area. The project is 53% complete, with total realized expenditures of US$839 million. The start-up is expected in the second half of 2015.

*Nacala Corridor.* Railway and port infrastructure connecting Moatize site to the Nacala-à-Velha maritime terminal, located in Nacala, Mozambique. The total realized expenditures is US$1.3 billion. The greenfield sections in Mozambique and Malawi are 56% complete, and the first train is expected to be operational by the end of 2014 with rail capacity at 11 Mtpy. Construction on rehabilitating existing railway sections will extend through 2016 and increase capacity up to 18 Mtpy.

**Base metals projects**

Copper mining project:

*Salobo II.* Salobo expansion, raising of the tailing dam height and increasing the mine capacity, located in Marabá, in the Brazilian state of Pará. The project is expected to provide an additional estimated nominal capacity of 100,000 tpy of copper in concentrate. We have concluded testing of the pipes from the filtering facility and are progressing on the electromechanical assembly of the plant. The project is 93% complete, with total realized expenditures of US$1.1 billion. The start-up is expected in the first half of 2014.

**Steel projects**

*Companhia Siderúrgica do Pecém* ("*CSP*"). Construction of a 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. The project will have an estimated nominal capacity of 3.0 Mtpy. Vale holds 50% of the joint venture. The civil construction and electromechanical work are in progress. We have already obtained preliminary and installation environmental licenses. US$873 million of expenditures have been realized. The start-up is expected in the second half of 2015.

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## 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 generally 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. In addition to the concessions described below, we have exploration licenses and exploration applications covering 5.63 million hectares in Brazil and 10.6 million hectares in other countries.

| Location | Concession or other right | Approximate area covered (in hectares) | Expiration date |
|---|---|---|---|
| *Brazil* | Mining concessions (including applications) | 662,076 | Indefinite |
| *Canada* | Mining concessions (terminology varies among provinces) | 279,977 | 2014-2034 |
| *Indonesia*(1) | Contract of work | 190,510 | 2025 |
| *Australia* | Mining leases | 19,209 | 2015-2041 |
| *New Caledonia* | Mining concessions | 21,269 | 2015-2051 |
| *Peru*(2) | Mining concessions | 154,867 | Indefinite |
| *Argentina* | Mining concessions | 161,628 | Indefinite |
| *Chile* | Mining concessions | 71,433 | Indefinite |
| *Mozambique*(3) | Mining concessions | 23,780 | 2032 |
| *Guinea* | Mining concessions | 102,400 | 2035 |

(1) May be entitled to at least one 10-year extension.

(2) The area reported reflects only licenses involving mining activities.

(3) Our mining concession covers 23,780 hectares. The definitive land license granted by the Council of Ministers, which is required to mine and utilize our concession, currently covers 22,096 hectares.

There are several proposed or recently adopted changes in mining legislation and regulations in the jurisdiction where we have operations that could materially affect us. These include the following:

*Brazil.* In June 2013, the Brazilian government sent to Congress a bill with proposed changes to the Brazilian mining law. This bill provides for: the preservation of the main provisions for existing mining rights as of the date of its enactment; a

new royalties regime; a new regime for mining concessions; and the creation of a mining agency. The bill is under discussion in Congress.

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*Indonesia.* A mining law that came into effect in 2009 introduced a new licensing regime (*Ijin Usaha Pertambangan*, or IUP) and called for certain adjustments to, and ultimate replacement of, existing mining contracts with the Indonesian government. Regulations implementing that law have gradually been promulgated by the government, but more are expected in 2014. PTVI does not currently hold any licenses under the IUP regime. As required by the 2009 mining law, PTVI started the renegotiation of its contract of work in 2012, which is expected to be completed in the first half of 2014. The Indonesian government seeks to renegotiate six strategic issues with each contract of work holder: (1) size of the concession area; (2) term and form of contract extension; (3) financial obligations (royalties and taxes); (4) divestment; (5) domestic processing and refining; and (6) priority use of domestic goods and services. See additional comments below on mining royalties.

*New Caledonia.* A mining law passed in 2009 requires mining projects to obtain authorization, rather than a declaration, from governmental authorities. We submitted an updated application for this authorization in March 2014. While under the law the authorities may take up to three years to issue the authorization, we currently expect to receive it within the next twelve months. Our existing mining declaration will remain valid and effective until our application is approved. Although we believe it is unlikely that our application will be rejected, the authorities may impose new conditions in connection with the authorization. The local authorities of New Caledonia proposed the creation of a protected wetland area, which will cover 27% of the surface area of the total VNC tenements and could affect potential mining activities. The proposed protected wetland area boundary also overlaps with the footprint of the next tailings storage facility, which may result in additional capital costs.

*Guinea.* We own a 51% interest in VBG Vale BSGR Limited, which holds iron ore concession rights in Simandou South (Zogota) and iron ore exploration permits in Simandou North (Blocks 1 & 2) in Guinea. VBG has also made an application for concession rights over Simandou North Blocks 1 & 2 and is awaiting a determination from the Government of Guinea. VBG has suspended work pending the outcome of the review of its concession described below.

A mining code adopted in 2011 and amended in 2013 imposes on all iron ore mining projects a requirement for 15% government participation free of charge, and allows the government to purchase an additional 20% stake. The mining code has also introduced more stringent requirements for all mining companies with existing operations in Guinea, including as regards mining tax, customs duties, employment, training, transparency and anti-corruption obligations. The 2013 amendments, which were aimed at addressing certain legal uncertainties created by the 2011 mining code, introduced new restrictive rules on matters such as taxes and royalties, foreign exchange regulations, transfers of interests in mining rights and marketing rights.

Additionally, the Government of Guinea has launched a contract review process to harmonize existing mining contracts with the new mining code. Regulations provide that the contract review process may result in the cancellation or the renegotiation of mining rights depending on the findings and the recommendations of a technical committee responsible for conducting the contract review process. Following its review of the mining titles, the technical committee has notified VBG that it intends to recommend that the Government of Guinea revoke the mining rights held by VBG. We do not have access to the full report of the technical committee, but we understand that its determination is based on corrupt practices in relation to the award of the VBG mining rights, before Vale acquired its interests in VBG. As far as we are aware, the technical committee has not alleged any wrongdoing by Vale. Vale acquired its interest in VBG after the completion of extensive due diligence conducted by outside advisors and on the basis of representations that VBG had obtained its mining rights lawfully and without any improper promises or payments. If the technical committee recommends revocation and the Government decides to accept that recommendation, Vale may lose its entire investment in the Simandou project subject to any rights to recourse Vale may have.

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*Mozambique.* The government proposed to Congress a bill with a new mining code in December 2012. Expected changes in the new code include introducing national preference for procurement, subjecting transfers of mining rights and share capital participation to Mozambican law and governmental approval, requiring foreign companies to partner with local service providers and reducing periods for exploration activities. Additionally, the resettlement regulation enacted in June 2012 contains stricter requirements that may result in increased costs and delays in the implementation of our projects. In addition, the Government of Mozambique passed a new regulation on explosives that came into effect in August 2013, which may result in significant increases in the cost of importing explosives critical to the operation of our mining activities in Tete. Following concerns from various companies in the extractive sector, the Government is currently reviewing the possibility of decreasing these new taxes, but it is not yet certain if and when such changes will be implemented.

**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 pay a royalty known as the 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 current rates on our products are: 2% for iron ore, copper, nickel, fertilizers and other materials; 3% on bauxite, potash and manganese ore; and 1% on gold.

*Brazilian states.* Several Brazilian states 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$2.5697 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.

*Indonesia.* Our subsidiary PTVI pays a royalty fee on, among other items, nickel produced in its concession area. The royalty payment is based on sales volume (for contained nickel matte, US$78 per metric ton, and for contained cobalt, US$140 per metric ton for total production below 500 tons, or US$156 per metric ton for total production above 500 tons). In 2013, the royalty payment was equal to 0.68% of revenues from the sale of nickel in matte products, while the average yearly royalty payment for the period from 2010 to 2013 was equal to 0.63% of revenues from the sale of nickel in matte products, including the additional royalty payment in 2011 for production beyond 160 million pounds in 2010. As part of ongoing renegotiations of our existing mining contract, as required by the new mining law, the Indonesian government is seeking to review our royalty regime.

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*Australia.* Royalties are payable on revenues from the sale of minerals. In the state of Queensland, for coal, the applicable royalty is 7% of the value (net of freight, late dispatch and other certain costs) up to A$100 per ton; 12.5% of the value between A$100 and A$150 per ton; and 15% thereafter. In the state of New South Wales, for coal, the applicable royalty is a percentage of the value of production total revenue (which is net of certain costs and levies) less allowable deductions of 6.2% for deep underground mines, 7.2% for underground mines and 8.2% for open cut mines. There is also a supplementary royalty payable of 1.95% (for coal recovered between December 1, 2012 and June 30, 2013) and 1% (for coal recovered on or after July 1, 2013) of the value of coal recovered. In July 2012, the Australian government introduced a mineral resource rent tax, MRRT. The MRRT taxes profits over a certain threshold generated from the exploitation of coal and iron ore resources in Australia. The tax is levied at an effective rate of 22.5% of assessable profit and is deductible for corporate income tax purposes. Unlike state royalties, which are based on the volume and value of the resource, the MRRT is based on profits. However, companies may credit state-based royalties against the MRRT. For the year ended December 31, 2013, Vale Australia was not liable for any MRRT.

*Mozambique.* The Government proposed a new tax regime for the mining and oil sectors in September 2013. With regards to the mining tax regime, the proposal has concepts and provisions that can affect mining projects in Mozambique, including a new royalty assessment rule, increase of mining production taxes, separate accounting for each mining title, among others. The new proposal is not clear with respect to the stabilization and security of the mining contracts signed prior to the proposed tax regime.

**Environmental regulations**

We are also subject to environmental regulations that apply to the specific types of mining and processing activities we conduct. We require approvals, licenses, permits or authorizations from governmental authorities to operate, and in most jurisdictions the development of new facilities requires us to submit environmental impact statements for approval and often to make investments to mitigate environmental impacts. We must also 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, the implementation of a Best Practices Guide for Environmental Licensing and the Environment, the deployment of highly-skilled specialist teams, closer interaction with environmental regulators and the creation of an Executive Committee to expedite internal decisions regarding licensing.

Environmental regulations affecting our operations relate, among other matters, to emissions into the air, soil and water; recycling and waste management; protection and preservation of forests, coastlines, caves, watersheds and other features of the ecosystem; water use; climate change and decommissioning and reclamation. 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. There are several examples of environmental regulation and compliance initiatives that could affect our operations. In Canada and Indonesia, we are making significant capital investments to ensure compliance with air emission regulations that address, among other things, sulfur dioxide, particulates and metals. In Australia, we started acquiring and acquitting permits from the federal government in June 2013 under the carbon pricing scheme. This scheme may be repealed under the new federal government (elected in 2013) and replaced with a new carbon reduction scheme. The details and timing for this new scheme are yet to be finalized.

A proposed new law in the South Province of New Caledonia will impose stricter limits on emissions of nitrogen oxide and sulphur oxide and particulates from large combustion power stations, which will affect the power station that supplies electricity to VNC. To meet these standards, this 100 MW power station will need to be upgraded, which is expected to result in the increase in the price of power paid by VNC.

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In Canada, more stringent water effluent regulations are being proposed, which may affect our operations. In the UK, a recent effluent regulatory change has been introduced, which resulted in a significant increase in soil disposal and other environmental compliance costs at our Clydach facility.

In Brazil, there is legislation for the protection of caves, including a broad decree published in October 1990 and revised in 2008. As a consequence of that revision, the Ministry of Environment published an ordinance in 2009 that established a methodology to classify the relevance of caves. These regulations require us to conduct extensive technical studies and to engage in complex discussions with Brazilian environmental regulators. These discussions are ongoing, and as a result, we cannot yet assess the final impact of these regulations on our operations. However, it is possible that 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.

**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 contracts granted by the federal government, and our railroad concessions are subject to regulation and supervision by the Brazilian Ministry of Transportation and the transportation regulatory agency (ANTT). Our railroad concession contracts have duration of 30 years and may be renewed at the federal government's discretion. The FCA and MRS concessions expire in 2026, and the concessions for EFC and EFVM expire in 2027. VLI also owns a subconcession for commercial operation of a 720-kilometer segment of the FNS railroad in Brazil, which expires in 2037. The actual prices we charge can be negotiated directly with the users of such services, subject to tariff ceilings approved by ANTT for each of the concessionaires and each of the different products transported. ANTT regulations also require concessionaires to give trackage rights to other concessionaires, make investments in the railway network, meet certain productivity requirements, among other obligations.

*Brazilian port regulation.* Port operations in Brazil are subject to regulation and supervision by ANTAQ, the federal agency in charge of maritime transportation, and the Secretary of Ports of the Federal Government (SEP). In June 2013, a new law provided a new set of rules for projects and existing terminals. The statute removed restrictions on servicing third party cargo and permitted ANTAQ's involvement in determining third party access to private terminals. In 2014, the private terminals will execute new contracts with SEP in order to adapt the provisions to the new regime.

*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.

*Regulation of the seaborne transport of iron ore and iron ore fines.* The International Maritime Organization has prepared amendments to existing rules governing safe shipping of products, including iron ore.

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## II. OPERATING AND FINANCIAL REVIEW AND PROSPECTS

### OVERVIEW

We delivered a strong operational performance in 2013, with solid results across all of our lines of business. Our cost-cutting efforts, discipline in capital expenditures and focus on our core business throughout the year improved our financial position, and we were able to lay the foundations for future growth in volume and free cash flow.

We registered record sales volumes in 2013 in iron ore and pellets, with 306 Mt, along with record sales of copper, gold and coal, and our highest nickel sales since 2008. Even as our sales volumes increased, we achieved substantial reductions in costs and expenses, in part through the simplification of our organizational structure.

By continuing to focus selectively on a narrower exploration and project development portfolio, we have been able to maintain our commitment to growth while reducing both 2013 research and development expenditures and capital expenditures. We also successfully sold non-core assets and investments in 2013 totaling US$6.0 billion, which demonstrated our continued commitment to the simplification of our asset base and management focus. Our cash generation allowed us to distribute dividends of US$4.5 billion in 2013.

We succeeded in mitigating some significant uncertainties in our business in 2013, allowing management to focus on our operational and strategic objectives. In particular, we elected to participate in the REFIS, a federal tax settlement program for payment of amounts relating to Brazilian corporate income tax and social contribution, in order to settle the claims related to the net income of our non-Brazilian subsidiaries and affiliates from 2003 to 2012.

Our receipt of implementation licenses for the S11D project and associated logistics was an important advance in a key part of our plan to increase our iron ore production beyond 2016. We also received authorization to mine additional areas around the N4 mine, which will support our production plans for 2014 and our growth program for 2015 and 2016.

We completed a number of projects necessary to expand our iron ore production in the period from 2014 to 2016: Conceição Itabiritos, Carajás plant 2 (formerly known as Additional 40 Mtpy), and CLN 150, including Pier IV with its first berth in Ponta da Madeira. In addition, we ramped up base metals projects at Salobo I, Onça Puma and New Caledonia, and we completed other key projects at Long Harbour and Totten. These investments mark the end of an investment cycle and position our business to achieve our cash generation target in the coming years.

Underpinning our solid performance this year is a relentless focus on health and safety. Our health and safety indicators improved in 2013, with our total recordable injury frequency rate (TRIFR) decreasing from 2.8 to 2.6 per million hours worked. We remain focused on achieving a record of zero harm in our operations.

**Sales volumes**

Our financial performance depends, among other factors, on the volume of production at our facilities. We publish a quarterly production report, which is available on our website and filed with the SEC on Form 6-K. Increases in the capacity of our facilities resulting from our capital expenditure program have an important effect on our performance. Our results are also affected by acquisitions and dispositions of businesses or assets, and they may be affected in the future by new acquisitions or dispositions. For more information on acquisitions since the beginning of 2013, see *Information on the company Business overview Significant changes in our business*.

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The following table sets forth, for our principal products, the total volumes we sold in each of the periods indicated.

| | Year ended December 31, | | |
|---|---|---|---|
| | 2011 | 2012 | 2013 |
| | (thousand metric tons) | | |
| Iron ore | 257,287 | 258,061 | 264,631 |
| Iron ore pellets | 41,861 | 45,382 | 40,991 |
| Manganese | 1,032 | 1,745 | 2,115 |
| Ferroalloys | 386 | 267 | 183 |
| Coal: | | | |
| Thermal coal | 5,342 | 3,134 | 726 |
| Metallurgical coal | 2,330 | 4,864 | 7,353 |
| Nickel | 252 | 232 | 261 |
| Copper | 302 | 285 | 353 |
| PGMs (oz) | 446 | 386 | 510 |
| Gold (oz) | 198 | 168 | 297 |
| Silver (oz) | 2,626 | 1,862 | 2,154 |
| Cobalt | 2.721 | 2.033 | 2,939 |
| Potash | 568 | 581 | 531 |
| Phosphates: | | | |
| MAP | 907 | 1,221 | 1,133 |
| TSP | 594 | 713 | 681 |
| SSP | 2,501 | 2,446 | 1,969 |
| DCP | 556 | 474 | 461 |
| Phosphate rock | 2,652 | 3,314 | 3,154 |
| Nitrogen | 1,278 | 1,342 | 890 |

**Average realized prices**

The following table sets forth our average realized prices for our principal products for each of the periods indicated. We determine average realized prices based on gross operating revenues, which reflect the price charged to customers including items, principally value-added tax, that we deduct in arriving at net operating revenues.

| | Year ended December 31, | | |
|---|---|---|---|
| | 2011 | 2012 | 2013 |
| | (US$ per metric ton, except where indicated) | | |
| Iron ore | 143.46 | 105.41 | 107.43 |
| Iron ore pellets | 195.98 | 148.89 | 150.22 |
| Manganese | 165.70 | 134.10 | 157.37 |
| Ferroalloys | 1,443.01 | 1,340.82 | 1,303.92 |
| Coal: | | | |
| Thermal coal | 95.54 | 82.39 | 81.17 |
| Metallurgical coal | 235.27 | 171.38 | 129.34 |
| Nickel | 22,680.41 | 17,866.38 | 14,900.24 |
| Copper | 8,420.73 | 7,595.44 | 6,709.18 |
| Platinum (US$/oz) | 1,716.81 | 1,590.87 | 1,469.78 |
| Gold (US$/oz) | 1,558.55 | 1,755.52 | 1,339.37 |
| Silver (US$/oz) | 31.64 | 33.82 | 20.02 |
| Cobalt (US$/lb) | 15.63 | 12.27 | 10.95 |
| Potash | 505.28 | 530.12 | 417.32 |
| Phosphates: | | | |
| MAP | 679.65 | 646.58 | 571.86 |
| TSP | 585.98 | 526.67 | 472.51 |
| SSP | 281.53 | 268.58 | 271.88 |
| DCP | 679.63 | 628.36 | 611.54 |
| Phosphate rock | 112.80 | 124.82 | 90.68 |
| Nitrogen | 612.01 | 597.01 | 610.27 |

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**Major factors affecting prices**

***Iron ore and iron ore pellets***

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 global industrial production. Iron ore and iron ore pellets are priced based on a wide array of quality levels and physical characteristics. Various factors influence price differences among the several types of iron ore, such as the iron content of specific ore deposits, the various beneficiation and purifying 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. Fines, lump ore and pellets typically command different prices.

Demand from China has been a principal driver of world demand and prices. Chinese iron ore imports reached 820 million metric tons in 2013, 10.1% above the 745.5 million metric tons imported in 2012 and 19.4% higher than 2011 levels, due mainly to the continued growth in Chinese steel production throughout 2013. We expect China's economic growth to continue during 2014, mainly driven by domestic demand. The reforms announced by the national government of China at the end of 2013 may affect demand for steel, as local governments will likely face budgetary restrictions on investments in infrastructure construction. On the other hand, demand from the property sector is expected to continue to grow, supported by continued urbanization. As a result, we expect iron ore demand from the steel industry to continue to grow, but at a slower pace.

Our iron ore prices are based on a variety of pricing options, which generally use spot price indices as a basis for determining the customer price. In 2012, there was a significant shift from agreements to price our iron ore on a quarterly basis, using the current quarter's three-month average of price indices, to using pricing options based on spot prices. That shift exposed us to greater price volatility, but it also allowed us to capture more value by bringing our point of sale closer to key Asian markets.

***Coal***

Demand for metallurgical coal is driven by steel demand, and future growth continues to be expected across Asia and the Indian sub-continent. Asia accounts for more than half of the steel market and consumes 75% of seaborne metallurgical coal. Chinese seaborne demand increased by 48%, to 77 million metric tons in 2013 compared to 52 million metric tons in 2012.

Despite firm demand, prices have remained depressed by the excess of supply. Seaborne exports grew by 11% in 2013, fueled by Australian exports, which grew by 9% in 2012 and 18% in 2013, gaining market share and accounting for 58% of seaborne trade. Due to the current over-supplied market, there is no incentive to expand metallurgical coal supply in the short term. Moreover, high-cost production has been displaced, which resulted in mine closures in 2013.

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. Demand decreased recently as natural gas gained market share. The appeal of natural gas increases as pollution concerns rise. In 2013, the production of shale gas in the United States reduced supply costs, and the gas price has a direct impact on coal prices. These trends are exacerbated by the oversupply of thermal coal, further depressing coal prices.

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Various other factors influence coal prices, including changing trends in mechanisms used to price metallurgical coal. Quarterly pricing remains predominant, but short term pricing trends continue to evolve slowly with more monthly pricing on term business, and a larger spot market in volume terms has been notable in 2013. The spot market for coal is mostly cleared in China, with some volume in India as well, although liquidity in the spot market is still limited. In 2013, there was only modest growth in the derivative market for metallurgical coal. Most of our term contracts are still priced on a quarterly basis, and alternate mechanisms are gradually being removed from the market. Price negotiations for thermal coal, which accounts for less than 10% of our coal sales, are held on spot and annual basis.

***Nickel***

Nickel is an exchange-traded metal, listed on the LME. Most nickel products are priced using 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, on average, 66% of global nickel consumption.

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 2013, 63% of our refined nickel sales were made for non-stainless steel applications, compared to the industry average for primary nickel producers of 34%, 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.

Primary nickel (including ferro-nickel, nickel pig iron and nickel cathode) and secondary nickel (i.e., scrap) are competing nickel sources for stainless steel production. The choice between different types of primary and secondary nickel is largely driven by their relative price and availability. In recent years, secondary nickel has accounted for about 45% of total nickel used for stainless steels, and primary nickel has accounted for about 55%. In 2013, Chinese nickel pig iron and ferro-nickel production is estimated at 590,000 metric tons, representing 25% of world primary nickel supply, compared to 20% and 16% of the world's supply in 2012 and 2011, respectively. However, the implementation of the Indonesian mining law restricting the export of unprocessed ores may affect Chinese nickel pig iron and ferro-nickel production going forward. We estimate that Indonesia represents more than 80% of the critical saprolite ores used in the production of ferro-nickel in China and over 20% of world refined production. If it remains in place, the ban on Indonesian ore exports enacted in January 2014 is expected to have a significant impact on the market in the coming years.

***Copper***

Growth in copper demand in recent years has been driven primarily by Chinese imports, 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 and the NYMEX, 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. Under a pricing system referred to as MAMA ("month after month of arrival"), sales of copper concentrates and anodes are provisionally priced at the time of shipment, and final prices are settled on the basis of the LME price for a future period, generally one to three months after the shipment date.

Demand for refined copper grew by an estimated 5% in 2013, and China was responsible for an equivalent of 44% of worldwide consumption. The supply of refined copper increased with the 8% growth in global mine output in 2013, which reflect both the ramp-up of new projects and improvements at existing operations. Throughout 2013, prices remained under pressure. For 2014 and 2015, we expect mine production to continue expanding based on prior investments.

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***Fertilizers***

Demand for fertilizers is based on market fundamentals similar to those underlying global demand for minerals, metals and energy. Rapid per capita income growth in emerging economies generally causes dietary changes marked by an increase in the consumption of proteins, which ultimately contributes to increased demand for fertilizer nutrients, including potash and phosphates, as they help boost production of grains to feed more livestock. Demand is also driven by the demand for bio-fuels, which have emerged as an alternative source of energy to reduce world reliance on sources of climate-changing greenhouse gases, because key inputs for the production of biofuels sugar cane, corn and palm are intensive in the use of fertilizers.

Sales of fertilizers are mainly on a spot basis using international benchmarks, although some large importers in China and India often sign annual contracts. Seasonality is an important factor for price determination throughout the year, since agricultural production in each region depends on climate conditions for crop production.

In 2013, global fertilizer market conditions were weak as a result of lower prices due to declining demand for in India and China. As a result, some production was redirected from these markets to Brazil, where seasonal effects determined by the end of crop season were already weighing on prices.

**Currency price changes**

Our results of operations are affected in several ways by changes in currency exchange rates. The most important of these are the following:

Most of our revenues are denominated in U.S. dollars, while most of our costs of goods sold are denominated in other currencies, including the *real* (54% in 2013) and the Canadian dollar (14% in 2013). In 2013, 27% of our costs of goods sold were denominated in U.S. dollars. As a result, changes in exchange rates, particularly with respect to the U.S. dollar, affect our costs and operating margins.

Most of our long-term debt is denominated in currencies other than the *real* (US$20.539 billion at December 31, 2013, not considering accrued charges), principally the U.S. dollar. Because our functional currency for accounting purposes is the Brazilian *real*, changes in the value of the U.S. dollar against the *real* result in exchange gain or loss on our net liabilities.

We had *real*-denominated debt of US$7.131 billion at December 31, 2013, excluding accrued charges. Since most of our revenue is in U.S. dollars, we use swaps to convert our debt service from *reais* to U.S. dollars. Changes in the value of the U.S. dollar against the *real* result in fair value variation on these derivatives, affecting our financial results. For more information on our use of derivatives, see *Risk management*.

A decline in the value of the U.S. dollar tends to result in: (i) lower operating margins and (ii) higher financial results due to currency gains on our net U.S. dollar-denominated liabilities and fair value gains on our currency derivatives. Conversely, an increase in the value of the U.S. dollar tends to result in: (i) better operating margins and (ii) lower financial results due to exchange losses on our net U.S. dollar-denominated liabilities and fair value losses on our currency derivatives.

The U.S. dollar appreciated against the *real* during the first quarter of 2013, as Eurozone-related uncertainties diminished. Several factors, including lower output growth in Brazil, led to a sharp nominal appreciation of the U.S. dollar against the *real* during the second quarter of 2013. This escalation of the dollar was partially reversed for a short period, but resumed in the fourth quarter of 2013, remaining roughly stable thereafter. On average, the U.S. dollar was 10.5% stronger in 2013 against the *real* than in 2012. As of December 31, 2013, the U.S. dollar had appreciated 15.1% against the *real* relative to December 31, 2012.

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Compared to the Canadian dollar, the average value of the U.S. dollar in 2013 was 2.9% lower than in 2012, but as of December 31, 2013, the U.S. dollar had appreciated 7% against the Canadian currency relative to December 31, 2012.

Overall, in 2013 exchange rate fluctuations affected our operating margins positively but resulted in net foreign exchange losses and losses on derivatives, as described under *Critical accounting policies and estimates Derivatives*.

**Effects of the REFIS in 2013**

In November 2013, we elected to participate in the REFIS, a federal tax settlement program for payment of amounts relating to Brazilian corporate income tax and social contribution, in order to settle the claims related to the net income of our non-Brazilian subsidiaries and affiliates from 2003 to 2012. Before this settlement, the total amount of tax contingency for the period from 2003 to 2012, including the years for which tax assessments had not yet been issued, was estimated at US$19.4 billion (equivalent to R$45.0 billion, including R$17.1 billion in principal, R$9.8 billion in penalties, R$12.0 billion in interest and interest on penalties and R$6.0 billion in statutory fees).

Participating in the REFIS had an impact of US$6.7 billion (R$14.8 billion) on net income in 2013 as described in note 20 to our consolidated financial statements. In future years, financial expenses will include the interest component of the REFIS payments. Our future cash flows will be affected by the monthly installments. For more information about the REFIS, see *Legal proceedings Litigation on Brazilian taxation of foreign subsidiaries*.

**Change in accounting presentation**

We have discontinued the preparation of financial statements in accordance with U.S. GAAP. We have adopted IFRS, as issued by the IASB, as the basis for the preparation and presentation of our financial statements and reporting to the SEC beginning with our financial statements as of and for the year ending December 31, 2013 presented in this annual report. This annual report and future reports filed with the SEC will only present financial information prepared in accordance with IFRS.

We first adopted IFRS, as issued by the IASB, for our financial statements for the year ended December 31, 2010, which we published and filed with the CVM. Our transition date from Brazilian GAAP to IFRS was January 1, 2009, and we used certain mandatory or elective exceptions under IFRS 1 in those financial statements. Since we have previously adopted IFRS in Brazil, we are not a "first time adopter" of IFRS for purposes of this annual report on Form 20-F.

For a reconciliation of our financial statements in accordance with IFRS from U.S. GAAP, see Note 33 to our consolidated financial statements.

**Change in accounting policies**

In 2013, we started to account for our employment benefits according to IAS 19R. In accordance with its transition provisions, we applied this standard restrospectively to the years 2011 and 2012 as well. The revisions under IAS 19R (i) eliminated the "corridor" method for recognition of actuarial gains and losses; (ii) simplified the accounting for changes in the assets and liabilities of plans, recognizing in the income statement service costs and net interest cost based on the net benefit asset or liability; and (iii) provided for recognition in comprehensive income of remeasurements of actuarial gains and losses, return on plan assets (net of interest income on assets) and changes in the effect of the asset ceiling. For more information, see Note 6 to our consolidated financial statements.

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## RESULTS OF OPERATIONS

In 2013, we generated net income attributable to the Company's stockholders of US$584 million compared to US$5.454 billion in 2012. This decrease was partly due to certain major non-recurring items in 2013, including: (i) US$4.048 billion of income taxes from continued operations paid in connection with the REFIS, after deductions, (ii) US$2.637 billion of net financial expenses related to the REFIS, (iii) US$2.940 billion of foreign exchange and monetary losses, (iv) US$2.298 billion in charges for impairment on assets, mainly related to the Rio Colorado potash project and (v) US$861 million of net fair value losses on foreign exchange and interest rate risk derivatives.

The following discussion addresses our continuing operations only, except as otherwise specified.

### Revenues

In 2013, our net operating revenues increased 0.5% to US$46.767 billion, primarily as a result of increases in the sales volumes of base metals, iron ore and metallurgical coal and higher prices of iron ore, which were partially offset by lower prices for base metals, fertilizers and metallurgical coal, and a decrease in the sales volume of iron ore pellets and fertilizers. Net operating revenues of each business segment are discussed below under *Results of operations by segment*.

The following table summarizes our net operating revenues by product for the periods indicated.

| | Year ended December 31, | | | | |
|---|---|---|---|---|---|
| | **2011** | **% change** | **2012** | **% change** | **2013** |
| | **(US$ million, except for %)** | | | | |
| Bulk materials: | | | | | |
| Iron ore | US$36,416 | (26.0)% | US$26,931 | 4.5% | US$28,137 |
| Iron ore pellets | 7,938 | (17.4) | 6,560 | (8.5) | 6,000 |
| Ferroalloys and manganese | 676 | (19.7) | 543 | (3.7) | 523 |
| Coal | 1,058 | 3.2 | 1,092 | (7.5) | 1,010 |
| Other ferrous products and services | 585 | (57.9) | 246 | (46.3) | 132 |
| Subtotal | 46,673 | (24.2) | 35,372 | 1.2 | 35,802 |
| Base metals: | | | | | |
| Nickel and other products(1) | 8,118 | (26.4) | 5,975 | (2.3) | 5,839 |
| Copper concentrate(2) | 1,103 | 4.8 | 1,156 | 25.2 | 1,447 |
| Subtotal | 9,221 | (22.7) | 7,131 | 2.2 | 7,286 |
| Fertilizers: | | | | | |
| Potash | 273 | 6.2 | 290 | (30.7) | 201 |
| Phosphates | 2,300 | 9.0 | 2,507 | (17.6) | 2,065 |
| Nitrogen | 679 | 2.9 | 699 | (32.9) | 469 |
| Others fertilizer products | 70 | 5.7 | 74 | 6.8 | 79 |
| Subtotal | 3,322 | 7.5 | 3,570 | (21.2) | 2,814 |
| Other products and services:(3) | 859 | (44.1) | 480 | 80.2 | 865 |
| Net operating revenues | US$60,075 | (22.5)% | US$46,553 | 0.5% | US$46,767 |

(1) Includes nickel co-products and by-products (copper, precious metals, cobalt and others).

(2) Does not include copper produced as a nickel co-product.

(3) Includes pig iron and energy.

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The following table summarizes, for the periods indicated, the distribution of our net operating revenues based on the geographical location of our customers.

| | Net operating revenues by destination | | | | | |
|---|---|---|---|---|---|---|
| | 2011 | | 2012 | | 2013 | |
| | (US$ million) | (% of total) | (US$ million) | (% of total) | (US$ million) | (% of total) |
| **North America** | | | | | | |
| Canada | US$1,403 | 2.3% | US$1,015 | 2.2% | US$1,043 | 2.2% |
| United States | 1,672 | 2.8 | 1,334 | 2.9 | 1,311 | 2.8 |
| Mexico | 114 | 0.2 | 29 | 0.1 | 29 | 0.1 |
| | 3,189 | 5.3 | 2,378 | 5.2 | 2,383 | 5.1 |
| **South America** | | | | | | |
| Brazil | 8,644 | 14.4 | 6,926 | 14.9 | 6,190 | 13.2 |
| Other | 1,110 | 1.8 | 779 | 1.7 | 776 | 1.7 |