Vale S.A.
Form 20-F
April 02, 2013

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As filed with the Securities and Exchange Commission on April 2, 2013

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, 2012
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)

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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
9.0% Guaranteed Notes due 2013, issued by Vale Overseas	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
$5^{5}/_{8}$% 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, 2012 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 ý International Financial Reporting Standards as issued by the International Accounting Standards Board o 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, mainly 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.

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 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 2012, Chinese demand represented 66% of global demand for seaborne iron ore, 48% of global demand for nickel and 41% of global demand for copper. The percentage of our gross operating revenues attributable to sales to customers in China was 36.2% in 2012. A 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, could 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 69.7% of our 2012 gross operating revenues, are used to produce carbon steel. Nickel, which accounted for 8.5% of our 2012 gross 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 sectoral 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 fertilizers is affected by global prices of agricultural commodities. 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 2012. Nickel refining in China, especially imported nickel ores, increased an estimated 390,000 metric tons from 2006 to 2012. In 2012, estimated Chinese nickel pig iron and ferro-nickel production increased 23%, representing 20% of global nickel output. Other long lead-time nickel projects outside China also began to ramp up production in 2012, and the increase in nickel supply may continue in coming years because of the ramp-up of new nickel projects.

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 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 several 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 several 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. In addition, under Brazilian law, a taxpayer intending to challenge a tax assessment in the judicial system must ordinarily provide the court with a bond or security in the amount of the assessment in order to suspend collection efforts. In some of our tax litigation cases, we may be required to post bond or some form of security with the court, and, depending on the nature, amount and scope of such a bond or pledge, this may have a significant financial impact on our business. 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 in which we operate may arise from time to time. Although we contribute to local communities with taxes, 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 of 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 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, 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 may also be required to meet domestic beneficiation requirements in certain countries in which we operate, such as local processing rules or increased export taxes on unprocessed ores. Such requirements can significantly increase the risk profile and costs of operations in those jurisdictions. We and the mining industry are subject to rising 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 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 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, 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.

Rules governing ocean transport of iron ore fines could affect our operations.

A portion of our production is in the form of non-concentrate iron ore. This type of ore has been occasionally compared to fines, which are small particles of ore. Current studies are analyzing whether these ores, when transported with a high moisture content, may begin to act like a fluid, although we have no record of such an event occurring, based on more than 50 years of safe shipping as a company. This might cause cargo to become less stable, presenting potential dangers to navigation. The operational risks depend on many factors, including the characteristics of the ore, the circumstances under which they are loaded and transported and the type of vessel used. To manage these risks, the shipping industry and maritime insurers generally follow rules adopted under the International Maritime Solid Bulk Cargoes (IMSBC) Code, but those rules do not currently specifically address the transportation of non-concentrate iron ore such as we produce in the Carajás mineral province in our Northern System. Potential changes to the rules are currently under consideration under the auspices of the International Maritime Organization (IMO). We believe that the safety of our shipping practices is evidenced by our long track record of safe operations, but regulatory changes could require us to modify our practices for handling or shipping our production, and these measures could increase our costs, require new investment, and even limit the volume of our exports.

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.

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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.

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

Our operations involve the use, handling, discharge and disposal of hazardous materials 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, 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. Vale has health, safety and environmental standards and management systems 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, and in some cases may lead us to postpone or even abandon a project. 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, 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 underground cavities have required us to conduct extensive technical studies and to engage in complex discussions with Brazilian environmental regulators, which are continuing. As a result, 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 mining or to incur additional costs to preserve underground cavities or to compensate for the impact on them, and the consequences could be material to production volumes, costs or reserves in our iron ore business.

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Concern over climate change and efforts to comply with international undertakings could lead governments to impose limits on carbon emissions, carbon taxes or emissions trading schemes applicable to our operations, which could adversely affect our operating costs or our capital expenditure requirements. For example, in 2012, the Brazilian government conducted public hearings to present and discuss certain proposed controls on carbon emissions for mining activities under the carbon emissions law (*Política Nacional de Mudanças Climáticas*), and the Australian government introduced a carbon pricing mechanism in July 2012 that requires certain companies, including us, to purchase carbon emissions permits. In addition, the IMO is studying mechanisms such as carbon pricing to reduce greenhouse gases emissions from international shipping, which may increase our international transportation costs.

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, 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.

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, mineral 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 ore 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.

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

We engage in mineral exploration, which is highly speculative 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.

Drilling and production risks could adversely affect the mining process.

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.

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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.

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

Energy costs are a significant component of our cost of production, representing 11.1% of our total cost of goods sold in 2012. To fulfill our energy needs, we depend on the following sources: oil by-products, which represented 48% of total energy needs in 2012, electricity (21%), coal (9%), natural gas (15%) and other energy sources (7%), using figures converted into tons of oil equivalent ("TOE").

Fuel costs represented 7.8% of our cost of goods sold in 2012. Increases in oil and gas prices adversely affect margins in our logistics services, mining, iron ore pellets, fertilizers and nickel businesses.

Electricity costs represented 3.3% of our total cost of goods sold in 2012. 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 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 2012 and 2011, we had currency losses of US$1.915 billion and US$1.382 billion, respectively, while in 2010 we had currency gains of US$102 million. 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* (57% in 2012) and the Canadian dollar (14% in 2012), 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.

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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.

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, 2013, 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 Ethical 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 respects, 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

We have prepared our financial statements in this annual report in accordance with generally accepted accounting principles in the United States ("U.S. GAAP"). We also publish financial statements in accordance with International Financial Reporting Standards ("IFRS"), which differ in certain respects from U.S. GAAP, and use IFRS in reports to Brazilian shareholders, in CVM filings, and in determining the legal minimum dividend under Brazilian law.

Beginning in 2013, we will cease to prepare and publish financial statements in accordance with U.S. GAAP. During 2013, we will publish interim financial statements under IFRS only, and beginning with our annual report on Form 20-F for the year 2013, we will present our audited annual financial statements in accordance with IFRS.

Our financial statements and the other financial information in this annual report have been translated from Brazilian *reais* into U.S. dollars on the basis explained in Note 3 to our financial statements, unless we indicate otherwise.

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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.

Statement of income data

	For the year ended December 31,				
	2008	**2009**	**2010**	**2011**	**2012**
			(US$ million)		
Net operating revenues	37,884	25,437	47,029	60,946	47,694
Cost of products and services	(18,099)	(15,747)	(20,550)	(25,529)	(26,591)
Selling, general and administrative expenses	(1,748)	(1,130)	(1,701)	(2,334)	(2,240)
Research and development	(1,085)	(981)	(878)	(1,674)	(1,478)
Impairment of goodwill	(950)				
Impairment on assets					(4,023)
Gain (loss) on sale of assets				1,513	(491)
Other expenses	(1,254)	(1,522)	(2,205)	(2,810)	(3,648)
Operating income	14,748	6,057	21,695	30,112	9,223
Non-operating income (expenses):					
Financial income (expenses), net	(1,975)	351	(1,725)	(1,672)	(2,013)
Exchange and monetary gains (losses), net	364	675	344	(1,641)	(1,788)
Gain on sale of investments	80	40			
Subtotal	(1,531)	1,066	(1,381)	(3,313)	(3,801)
Income before discontinued operations, income taxes and equity results	13,217	7,123	20,314	26,799	5,422
Income taxes charge	(535)	(2,100)	(3,705)	(5,282)	833
Equity in results of affiliates, joint ventures and other investments	794	433	987	1,135	640
Impairment on investments					(1,641)
Net income from continuing operations	13,476	5,456	17,596	22,652	5,254
Discontinued operations, net of tax			(143)		
Net income	13,476	5,456	17,453	22,652	5,254
Net income (loss) attributable to non-controlling interests	258	107	189	(233)	(257)
Net income attributable to Company's shareholders	13,218	5,349	17,264	22,885	5,511
Total cash paid to shareholders(1)	2,850	2,724	3,000	9,000	6,000

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

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Earnings per share

	For the year ended December 31,				
	2008	2009	2010	2011	2012
	(US$, except as noted)				
Earnings per share:					
Per common share	2.58	0.97	3.23	4.33	1.07
Per preferred share	2.58	0.97	3.23	4.33	1.07
Weighted average number of shares outstanding (in thousands)(1)(2):					
Common shares	3,028,817	3,181,706	3,210,023	3,197,063	3,172,179
Preferred shares	1,946,454	2,030,700	2,035,783	1,984,030	1,933,491
Treasury common shares underlying convertible notes	56,582	74,998	18,416	18,416	
Treasury preferred shares underlying convertible notes	30,295	77,580	47,285	47,285	
Total	5,062,148	5,364,984	5,311,507	5,246,794	5,105,670
Distributions to shareholders per share(3):					
Expressed in US$	0.56	0.53	0.57	1.74	1.17
Expressed in R$	1.09	1.01	0.98	2.89	2.26

(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 a global equity offering in July 2008 and share repurchase programs conducted from October 2008 to May 2009, from September 2010 to October 2010 and 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.*

Balance sheet data

	At December 31,				
	2008	2009	2010	2011	2012
	(US$ million)				
Current assets	23,238	21,294	31,791	21,736	22,897
Property, plant and equipment, net and intangible assets	49,329	68,810	84,370	90,030	91,766
Investments in affiliated companies and joint ventures and other investments	2,408	4,585	4,497	8,093	6,492
Other assets	5,017	7,590	8,481	8,869	10,323
Total assets	79,992	102,279	129,139	128,728	131,478
Current liabilities	7,237	9,181	17,912	11,043	12,585
Long-term liabilities(1)	10,173	12,703	17,195	16,033	15,731
Long-term debt(2)	17,535	19,898	21,591	21,538	26,799
Total liabilities	34,945	41,782	56,698	48,614	55,115
Redeemable non-controlling interests	599	731	712	505	487
Shareholders' equity:					
Capital stock	23,848	23,839	23,726	36,903	38,088
Additional paid-in capital	393	411	2,188	(61)	(529)
Mandatorily convertible notes common ADSs	1,288	1,578	290	290	
Mandatorily convertible notes preferred ADSs	581	1,225	644	644	
Reserves and retained earnings	16,446	29,882	42,051	39,939	36,682
Total Company shareholders' equity	42,556	56,935	68,899	77,715	74,241

Non-controlling interests	1,892	2,831	2,830	1,894	1,635
Total shareholders' equity	44,448	59,766	71,729	79,609	75,876
Total liabilities and shareholders' equity	79,992	102,279	129,139	128,728	131,478

(1) Excludes long-term debt.

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

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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 15 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 to transport iron ore. Directly and through affiliates and joint ventures, we also have investments in energy and steel businesses.

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

	Year ended December 31,					
	2010		2011		2012	
	US$ million	% of total	US$ million	% of total	US$ million	% of total
Bulk materials:						
Iron ore	US$28,120	58.3%	US$36,910	59.2%	US$27,202	55.8%
Iron ore pellets	6,402	13.3	8,204	13.1	6,776	13.9
Manganese and ferroalloys	922	1.9	732	1.2	592	1.2
Coal	770	1.6	1,058	1.7	1,092	2.3
Subtotal bulk materials	US$36,214	75.1%	US$46,904	75.2%	US$35,662	73.2%
Base metals:						
Nickel and other products(1)	US$ 4,712	9.8%	US$ 8,118	13.0%	US$ 5,975	12.2%
Copper(2)	934	1.9	1,126	1.8	1,158	2.4
Aluminum(3)	2,554	5.3	383	0.6		
Subtotal base metals	US$ 8,200	17.0%	US$ 9,627	15.4%	US$ 7,133	14.6%
Fertilizer nutrients	1,845	3.8	3,547	5.7	3,777	7.7
Logistics services	1,465	3.0	1,726	2.8	1,644	3.4
Other products and services(4)	493	1.1	541	0.9	537	1.1
Total gross operating revenues	US$48,217	100.0%	US$62,345	100.0%	US$48,753	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) Reflects aluminum operations we sold in February 2011.

(4) 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. 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 Vale Australia Holdings 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 have completed our nickel mine and processing facility in New Caledonia and are currently ramping up operations. The ramp-up of our nickel operations in Onça Puma, Brazil was suspended in June 2012 due to equipment damage and is expected to resume in the second half of 2013. For more information about these interruptions, see *Significant changes in our business*.

- *Copper.* In Brazil, we produce copper concentrates at Sossego and Salobo, in Carajás, in the 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 Chile, we produce copper cathodes at the Tres Valles operation, located in the Coquimbo region. Our joint venture to produce copper concentrates at Lubambe, Zambia, started production at the end of 2012.

- *Aluminum.* We hold a 22% interest in Norsk Hydro ASA ("Hydro"), a major aluminum producer. We still own minority interests in two bauxite mining businesses, Mineração Rio do Norte S.A. ("MRN") and Mineração Paragominas S.A. ("Paragominas"). We will transfer our remaining interest in Paragominas to Hydro in two equal tranches in 2014 and 2016. Both MRN and Paragominas are located in Brazil.

- *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.

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. In addition, we are ramping up operations at 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 and ports. Two of our four iron ore systems include an integrated railroad network linked to automated port and terminal facilities, which provide rail transportation for our mining products, general cargo and passengers, bulk terminal storage, and ship loading services for our mining operations and for customers. We are constructing a world-class logistics infrastructure to support our operations in Central and Eastern Africa. We conduct seaborne dry bulk shipping and provide tug boat services. We own and charter vessels to transport the iron ore that we sell on a cost and freight ("CFR") basis to customers. We also have interests in Log-In Logística Intermodal S.A. ("Log-In"), which provides intermodal logistics services in Brazil, Argentina and Uruguay, and in MRS Logística S.A. ("MRS"), which transports our iron ore products from the Southern System mines to our Guaíba Island and Itaguaí maritime terminals, in the state of Rio de Janeiro.

Business strategy

Our mission is to transform natural resources into prosperity and sustainable development. Our vision is to be the best global natural resources company at creating long-term value through excellence and passion for people. 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, disciplined capital allocation and lower costs. Our priority has shifted from marginal volume to capital efficient volume, a move that has significant implications for the way we manage our capital. 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 in order to maximize return on invested capital and total return to shareholders. 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, contributing to moderate the use of our balance sheet. 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 2012, we had an estimated market share of 23.8% of the total volume traded in the seaborne market, in line with 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. We have also encouraged steelmakers to develop steel projects in Brazil through joint ventures in which we may hold minority stakes, in order to create additional demand for our iron ore.

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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, 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 67% of our nickel sales in 2012. Our long-term goal is to strengthen our leadership in the nickel business. We are currently optimizing our operational flowsheet and reviewing our asset utilization aiming at cost efficiency and improving returns.

We operate the Sossego copper mine in Carajás, in the Brazilian state of Pará, and the Tres Valles copper mine in Chile. We also recover copper in conjunction with our nickel operations, principally at Sudbury and Voisey's Bay, in Canada. We are ramping up Salobo, located in the Brazilian state of Pará, which has a nominal capacity of 100,000 tons of copper in concentrate with its first stage, Salobo I. The copper mines, situated in Carajás, benefit from our infrastructure facilities serving the Northern System. We have started copper production at the Lubambe (previously Konkola North) copper mine in Zambia through a joint venture.

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.

Investing in fertilizer nutrients

We are investing in potash and phosphate rock in order to benefit from rising global consumption of proteins, which is expected to grow significantly in coming years, especially in emerging market countries. We operate a potash mine in Brazil (Taquari-Vassouras) and a phosphate rock operation in Peru (Bayóvar). Our portfolio also includes potash projects and mineral exploration initiatives to meet the increasing Brazilian demand for fertilizers, as part of our growth strategy. For more information, see *Significant changes in our business* below.

Development of our resource base

We are engaged in mineral exploration initiatives in 15 countries, and we focus on exploration and project development efforts that we believe have the potential to create the most value for our investment. Our exploration activities encompass iron ore, nickel, copper, coal, potash and phosphates. Iron ore and nickel, given our sizable existing deposits, are the main priorities for brownfield exploration, while our greenfield exploration efforts focus on copper deposits.

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, together with the shortage of efficient transportation for general cargo in Brazil, 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.

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 a floating transfer station ("FTS") in the Philippines, and we continue to invest in a fleet of Valemax vessels primarily dedicated to maritime freight service from Brazil to Asia. We are also investing in the development of a distribution center in Malaysia and a second FTS in Asia in order to enhance the competitiveness of our iron ore business in the region.

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

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 68% 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.

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 2012.

Organic growth

We have an extensive program of investments in the organic growth of our businesses. Our main investment projects are summarized under *Capital and R&D expenditures*. The most significant projects that have come on stream since the beginning of 2012 are summarized below:

Salobo I In June 2012, we started production at the Salobo I processing plant, with an estimated nominal capacity of 100,000 tpy of copper in concentrate. The planned expansion of Salobo in 2014, by starting up Salobo II, is expected to increase nominal capacity to 200,000 tpy of copper in concentrate and up to 327,000 ounces per year of gold by-product.

Lubambe (previously Konkola North) In October 2012, we started operations at Lubambe with TEAL Exploration & Mining Inc. ("TEAL"), a 50-50 joint venture with African Rainbow Minerals Limited ("ARM"). The project consists of an underground copper mine, plant and related infrastructure in the Zambian Copperbelt. TEAL has an 80% stake in the project, and Zambia Consolidated Copper Mines PLC holds the remaining 20% stake. The estimated nominal capacity of the project is 45,000 tpy of copper in concentrate.

Oman We reached full production capacity of our direct reduction pellet operations in the industrial site of Sohar, Oman, with estimated aggregate capacity of 9.0 Mtpy. Our two plants each have capacity to produce 4.5 Mtpy, and the bulk terminal and a distribution center have throughput capacity of 40 Mt annually.

Estreito In March 2013, the last of the eight turbines of the Estreito hydroelectric power plant became operational. Estreito is located in the Tocantins River, on the border of the northern Brazilian states of Maranhão and Tocantins. The plant will have an installed capacity of 1,087 megawatts. We have a 30% stake in the consortium that operates the plant.

Divestitures

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 2012.

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Kaolin business In May 2012, we sold our 61.5% stake in CADAM S.A. ("CADAM") to KaMin LLC for US$30.1 million, thereby divesting our entire kaolin business. CADAM operates an open-pit kaolin mine in the state of Amapá, Brazil, as well as a processing plant and a private port, both in the state of Pará, Brazil.

Colombian thermal coal assets In June 2012, we concluded the sale of our thermal coal operations in Colombia to CPC S.A.S., an affiliate of Colombian Natural Resources S.A.S., for US$407 million in cash. The thermal coal operations in Colombia consisted of the El Hatillo coal mine and the Cerro Largo coal deposit, the Sociedad Portuaria Rio Cordoba coal port facility and an 8.43% equity stake in the Ferrocarriles del Norte de Colombia S.A. railway connecting the coal mines to the port facility.

Sale of ore carriers In August 2012, we signed an agreement to sell and charter 10 large ore carriers with Polaris Shipping Co. Ltd. ("Polaris") for US$600 million. We had purchased these vessels in 2009 and 2010 and converted them from oil tankers into ore carriers, each with a capacity of approximately 300,000 DWT, in order to provide us with a fleet of vessels dedicated to the transport of iron ore to our customers. We will charter back the vessels sold to Polaris under long-term charter contracts, which preserve our capacity for maritime transportation of iron ore without the related ownership and operational risks.

European manganese ferroalloy operations In October 2012, we concluded the sale of Vale Manganèse France SAS and Vale Manganese Norway AS, which constituted all of our manganese ferroalloy operations in Europe, to subsidiaries of Glencore International Plc for US$160 million in cash.

Fertilizer assets In December 2012, we signed with Petróleo Brasileiro S.A ("Petrobras") an agreement to sell Araucária Nitrogenados S.A. ("Araucária"), a producer of nitrogens, located in Araucária, in the Brazilian state of Paraná, for US$234 million. The purchase price will be paid by Petrobras in quarterly installments with interest. The sale is subject to conditions precedent, including the approval by the *Conselho Administrativo de Defesa Econômica* ("CADE"), the Brazilian antitrust authority.

Stake in oil and gas exploration concession In December 2012, we signed an agreement with Statoil Brasil Óleo e Gás Ltda. ("Statoil") to sell our 25% participation in the BM-ES-22A oil and gas exploration concession in the Espírito Santo Basin, Brazil, for US$40 million in cash. The sale also eliminates Vale's commitment to expenditures of approximately US$80 million through the end of 2013. The closing of the transaction is subject to customary conditions precedent and regulatory approvals.

Acquisitions

Increased stake in our subsidiary EBM In the second quarter of 2012, we acquired for US$437 million an additional 10.46% of Empreendimentos Brasileiros de Mineração S. A. ("EBM"), whose main asset is its stake in Minerações Brasileiras Reunidas S.A. ("MBR"), which owns three mining sites in Brazil, including Itabirito, Vargem Grande and Paraopeba (Southern System). As a result of the acquisition, we increased our stake in EBM to 96.7% and in MBR to 98.3%.

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Completion of the Belvedere acquisition In February 2013, we concluded the acquisition from 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 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 agreed to acquire an additional 12.47% stake in Capim Branco I and II hydroelectric power plants from Suzano Papel e Celulose S.A. for R$223 million. The completion of this transaction is subject to customary conditions, including approvals by CADE and the Brazilian electricity regulatory agency. Upon completion of this acquisition, our stake in Capim Branco I and II will increase to 60.89%, which stake will give us the right to receive around 1,524 gigawatt hours of energy per year until the end of the concession in 2036.

Sale of gold streams from Salobo and Sudbury mines

In February 2013, we entered into an agreement with Silver Wheaton Corp. ("Silver Wheaton") to sell 25% of the gold produced as a by-product at our Salobo copper mine, in Brazil, for the life of that mine and to sell 70% of the gold produced as a by-product at our Sudbury nickel mines, in Canada, for the next 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.

Adjustment of pellet production

We suspended operations at our São Luís pellet plant in October 2012 and at our Tubarão I and II pellet plants in November 2012. We implemented these suspensions due to the changes we observed in steel industry demand for raw materials, which involved a contraction in pellet consumption in favor of greater use of sinter feed. We allocated an additional portion of our iron ore production to the supply of sinter feed, reducing the availability of pellet feed for the pelletizing process. Employees at the affected pellet plants were reassigned to other operational activities.

Nickel mines put on care and maintenance status

In October 2012, we placed our Frood mine (which is a part of the Stobie mine) in Sudbury, Canada, on care and maintenance status, because it was operating at a loss under prevailing nickel prices. We expect a minimal or no adverse impact on our production of finished nickel, because mine output losses could be offset by higher production in our existing nickel operations in Canada and Indonesia. When an operation is on care and maintenance status, the mine is not in production, but scheduled infrastructure and other maintenance continue so that production activity can resume when required.

Onça Puma furnace reconstruction

Our nickel operations at Onça Puma have been suspended since June 2012 due to damage to the two furnaces. We are rebuilding one of the furnaces and plan to resume the ramp-up of operations in the second half of 2013. The nominal capacity of Onça Puma with only one furnace operating will be approximately 25,000 tpy. As a result, and in view of the weak current market environment for ferronickel, we have recognized an impairment charge in 2012 of US$2.849 billion before tax.

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Resumption of operations at Vale New Caledonia

In November 2012, our nickel operation in New Caledonia resumed production after a shut-down due to an incident in the acid plant in May 2012. Repairs to the acid plant and the installation of the refining columns of the solvent extraction circuit were concluded, and the integrated operation is ramping up. Our principal goal for New Caledonia is to achieve process stability and continue to increase throughput. In the fourth quarter of 2012, we produced 812 tons of nickel in nickel oxide, which will be accounted for as production once it is processed as utility nickel at our Dalian plant in China. In January 2013, we produced 1,380 tons of nickel, with 87% of it contained in nickel oxide and 13% contained in nickel hydroxide cake (NHC).

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 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.

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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.

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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).	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 and pellet feed.	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 two 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, two major beneficiation plants and three secondary beneficiation plants); Vargem Grande (three mines and one major beneficiation plant); 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 lumps 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, pipeline, 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, 2010	2011	2012	Recovery rate
		(million metric tons)			(%)
Southeastern System					
Itabira					
Cauê	Open pit	19.3	18.6	17.8	63.4
Conceição	Open pit	19.4	21.4	19.9	76.0
Minas Centrais					
Água Limpa(1)	Open pit	5.0	5.0	4.6	46.6
Gongo Soco	Open pit	6.8	5.3	4.4	99.7
Brucutu	Open pit	29.7	30.9	31.7	76.8
Mariana					
Alegria	Open pit	13.6	14.7	14.7	84.2
Fábrica Nova	Open pit	12.5	13.2	13.0	70.1
Fazendão	Open pit	10.6	11.1	9.5	100.0
Total Southeastern System		116.9	120.2	115.6	
Southern System					
Minas Itabirito					
Segredo/João Pereira	Open pit	12.4	11.8	12.2	75.7
Sapecado/Galinheiro	Open pit	17.7	18.6	19.6	69.6
Vargem Grande					
Tamanduá	Open pit	8.6	8.8	9.7	80.6
Capitão do Mato	Open pit	8.2	7.3	7.3	80.6
Abóboras	Open pit	5.2	5.3	5.6	100.0
Paraopeba					
Jangada	Open pit	3.5	5.1	6.1	100.0
Córrego do Feijão	Open pit	6.8	6.8	6.8	79.8
Capão Xavier	Open pit	9.3	8.4	9.6	84.8
Mar Azul	Open pit	3.0	4.1	3.3	100.0
Total Southern System		74.7	76.3	80.3	
Midwestern System					
Corumbá	Open pit	2.8	4.1	4.6	76.6
Urucum	Open pit	1.4	1.5	1.8	77.9
Total Midwestern System		4.2	5.6	6.4	
Northern System					
Serra Norte					
N4W	Open pit	33.4	38.9	39.3	91.4
N4E	Open pit	22.2	20.1	18.7	91.4
N5	Open pit	45.6	50.8	48.8	91.4
Total Northern System		101.2	109.8	106.8	106.8
Vale		297.0	311.8	309.0	
Samarco(2)		10.8	10.8	10.9	56.8
Total		307.8	322.6	320.0	

(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.

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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 Oman plants, 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 2012 pellet production, including the production of our joint ventures, 65.3% was blast furnace pellets and 34.7% 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 joint ventures, except for Samarco, Zhuhai YPM and Anyang, to which we supply only part of their requirements. In 2012, we sold 2.4 million metric tons to Hispanobras, 10.2 million metric tons to Samarco and 0.9 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, including Hispanobras as of July 1, 2012. 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).		
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.			
Vargem Grande (state of Minas Gerais)	Part of the Southern System. Receives iron ore from the Pico mine and production is transported by MRS.	7.0	Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Vale.			
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 temporarily 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.		

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Company/ Plant	Description / History	Nominal Capacity (Mtpy)	Power Source	Other Information	Vale's Share (%)	Partners
Samarco	Three pellet plants in two operating sites 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.	Building a 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")	Sohar industrial complex. Two pellet plants (totaling 9.0 Mtpy of capacity for direct reduction pellets). The pellet plants are located in an area where we will have a distribution center with capacity to handle 40.0 Mtpy.	9.0	Supplied through the national electricity grid.	Both plants have been producing at full capacity since March 2012. In October 2012, pursuant to a shareholders' agreement dated May 29, 2010 between Vale International and Oman Oil Company S.A.O.C. ("OOC"), 30% of the shareholding of VOPC was transferred to OOC for US$71 million.	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., Pioneer Iron and Steel Group Co, Ltd.(1)
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.

(1) Based on the most recent publicly filed business license of Zhuhai YPM.

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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, 2010	2011	2012
		(million metric tons)	
Vale(1)	36.3	39.0	40.2
Hispanobras(2)	1.9	2.1	4.3
Samarco(3)	10.8	10.7	10.7
Zhuhai YPM(3)	0.3	0.3	0.2
Anyang(3)		0.2	0.2
Total	49.3	52.3	55.6

(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. We signed a 30-year operating lease contract for Nibrasco's two pellet plants in May 2008.

(2) Production figures for 2012 are being consolidated 100% on a pro forma basis. On July 1, 2012, we signed a three-year operating lease for Hispanobras' pellet plant.

(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 2012, China accounted for 49.0% of our iron ore and iron ore pellet shipments, and Asia as a whole accounted for 66.2%. Europe accounted for 17.1%, followed by Brazil with 11.7%. Our 10 largest customers collectively purchased 112.0 million metric tons of iron ore and iron ore pellets from us, representing 37% of our 2012 iron ore and iron ore pellet shipments and 35% of our total iron ore and iron ore pellet revenues. In 2012, no individual customer accounted for more than 10.0% of our iron ore and iron ore pellet shipments.

In 2012, 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 quarterly pricing (based on either the current quarter or lagged averages of price indices), monthly average of price indices, and daily prices set on specific dates.

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 very strong, our quality differential is in many cases more valuable to customers than a freight differential. Second, steel companies often develop sales relationships based on a reliable supply of a specific mix of iron ore and iron ore pellets. We have a customer-oriented marketing policy and place specialized personnel in direct contact with our customers to help determine the blend that best suits each particular customer.

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 a FTS in the Philippines, which are operating. We are also building another FTS in Asia, which is scheduled to be delivered in 2013, and we are investing in a distribution center in Malaysia. We have also ordered new ships, purchased used vessels and entered into medium- and long-term freight contracts. 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. From 2009 until June 2012, we also conducted thermal coal operations in Colombia. In June 2012, we sold our thermal coal operations in Colombia for US$407 million in cash. 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.	Mining concessions 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 coal handling and processing plant ("CHPP") with a capacity of 1,200 metric tons per hour.	Mining tenements expiring in 2026 and 2030.	Supplied through the national electricity grid. Acquired from local utility companies.	Production is loaded onto trains at a purpose-built rail loadout facility for transport 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 172 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.	Mining tenements expiring in 2025.	Supplied through the national electricity grid. Acquired from local utility companies.	Railed 180 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 coal production.

Operation	Mine type	Production for the year ended December 31, 2010	2011	2012
		(thousand metric tons)		
Metallurgical coal:				
Vale Australia				
Integra Coal(5)	Underground and open-cut	1,151	467	962
Isaac Plains(1)	Open-cut	590	635	709
Carborough Downs(2)	Underground	1,216	1,390	911
Broadlea	Open-cut	101	0	0
Vale Moçambique				
Moatize(3)	Open-cut		275	2,501
Total metallurgical coal		3,057	2,766	5,083
Thermal coal:				
Vale Colombia				
El Hatillo(4)	Open-cut	2,991	3,565	
Vale Australia				
Integra Coal(5)	Open-cut	305	325	351
Isaac Plains(1)	Open-cut	371	274	381
Broadlea(6)	Open-cut	165	0	0
Vale Moçambique				
Moatize(3)	Open-cut		342	1,267
Total thermal coal		3,832	4,506	1,999

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

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

(3) Moatize started production in August 2011.

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

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

(6) Broadlea Coal has been on care and maintenance status since December 2009. The washing of the ROM stockpiles was finalized in June 2010.

1.2.3 Customers and sales

The coal sales from our Australian operations are primarily focused on East Asia. In 2012, our Chinese coal joint ventures directed their sales mainly to the Chinese domestic market. The coal sales from our Colombian operations, prior to our divestiture of our Colombian assets in June 2012, were primarily destined for Europe and Central and South America. The coal sales from our Mozambican operations will be directed to the main seaborne coal markets, including East Asia, the Americas, Europe and India.

1.2.4 Competition

The global coal industry, which is primarily comprised of the markets for hard coal (metallurgical coal and thermal coal) and brown coal/lignite, is highly competitive.

Growth in the demand for steel, especially in Asia, underpins strong demand for metallurgical coal. Major port and rail constraints in some of the countries in which major suppliers are located could lead to limited availability of incremental metallurgical coal production.

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 several other coal producers.

Major participants in the coal seaborne market are subsidiaries and affiliates of BHP Billiton Mitsubishi Alliance ("BMA"), Xstrata plc ("Xstrata"), Anglo Coal, Rio Tinto, Teck Cominco, Peabody 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.	Low-grade ores (24% manganese grade).	Crushing and 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, 2010	2011	2012	Recovery rate
		(million metric tons)			(%)
Azul	Open pit	1.6	2.1	1.9	66.0
Morro da Mina	Open pit	0.1	0.1	0.2	82.5
Urucum	Underground	0.2	0.3	0.3	84.0
Total		1.8	2.5	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. Until October 2012, we also conducted manganese ferroalloy operations in Europe through our wholly-owned subsidiaries Vale Manganèse France SAS and Vale Manganese Norway AS. These subsidiaries were sold to affiliates of Glencore International Plc for US$160 million in cash in October 2012.

The production of ferroalloys consumes significant amounts of electricity, representing 6.3% of our total consumption in 2012. The electricity supply to our ferroalloy plants is provided through long-term contracts. 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 6 furnaces, medium carbon ferro-manganese refining stations and a briquetting plant. Ouro Preto has 3 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 long term contracts.
Bahia Plant	City of Simões Filho	4 furnaces, medium carbon ferro-manganese converter process and a sintering plant.	150,000 tons per year	Supplied through the national electricity grid. Energy acquired from independent producers through long term contracts.

The following table sets forth information about our ferroalloys production.

	Production for the year ended December 31,		
Plant	2010	2011	2012
	(thousand metric tons)		
Barbacena	71	67	65
Ouro Preto	62	61	62
Simões Filho	73	76	79
Total	207	204	206

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. 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 Sudbury when it acquired Inco Ltd. in 2006.	Primarily underground mining operations with nickel sulfide ore bodies, which also contain co-deposits of copper, cobalt, PGMs, gold and silver. Frood mine (in Sudbury) was placed on care and maintenance status in October 2012. We also smelt and refine an intermediate product, nickel concentrate, from our Voisey's Bay operations. We ship a nickel intermediate product, nickel oxide, from our Sudbury smelter to our nickel refinery in Wales for processing into finished nickel.	Patented mineral rights with no expiration date; mineral leases expiring between 2014 and 2032; 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 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 was discovered in 1956 and was acquired by Vale when it acquired Inco Ltd. in 2006.	Primarily underground mining operations with nickel sulfide ore bodies. The ore bodies also contain co-deposits of copper and cobalt. We are considering placing the Birchtree mine on care and maintenance status. We also smelt and refine an intermediate product, nickel concentrate, from our Voisey's Bay operations. Smelting and refining are being considered for phase out in Thompson given the significant capital investment required under the pending federal sulfur dioxide emission	Order in Council leases expiring between 2020 and 2025; mineral leases expiring in 2013.	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.

	standards that are expected to come into effect in 2015, and the lower prioritization of this project relative to other investment alternatives.	

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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 with the acquisition of Inco Ltd. in 2006.	Comprised of the Ovoid mine, an open-pit mine, and deposits with the potential for underground operations at a later stage. We mine nickel sulfide ore bodies, which also contain deposits of 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 Long Harbour plant is operational, our nickel concentrate from Labrador will be redirected to Long Harbour.	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.
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 our Sudbury operations 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.

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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 80,000 metric tons per year. PTVI's shares are traded on the Indonesia Stock Exchange. We hold 59.2% of its share capital, Sumitomo Metal Mining Co., Ltd ("Sumitomo") holds 20.3% and the public holds 20.5%. PTVI commenced operations in 1968 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 directly by Vale. A major part is supplied at low cost by its three hydroelectric power plants on the Larona River. 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 40 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%). Sumic, a joint venture between Sumitomo and Mitsui, has a put option to sell us all of its shares, at the lower of (1) net book value, as per French GAAP, and (2) fair market value, if VNC does not achieve commercial production (60 days of continuous production at 80% of full capacity) by December 31, 2014. Sumic also has a purchase option for the 6.5% dilution that occurred in December 2012 after the start-up of commercial production at VNC. SPMSC has an obligation to increase its share in VNC to 10% within two years as of the start-up of commercial production.	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 ramp up VNC over a four-year period 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 2016 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 60,000metric tons per year. Vale owns 87.2% of the share, 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 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 local stainless steel industry in Taiwan, using intermediate products from our Matsuzaka 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 local stainless steel industry primarily in China, using intermediate products 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 over water in containers to 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) 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.
South Atlantic						
Vale/Onça Puma	Brazil Ourilândia do Norte, Pará	Mining and processing operations (producer of ferro-nickel).	The Onça Puma mine is built on lateritic nickel deposits of saprolitic laterite ore. We have temporarily interrupted the ramp-up of the Onça Puma project in Ourilândia do Norte, in the Brazilian state of Pará, but expect to resume production initially with one furnace in the second half of 2013 to reach a nominal capacity of	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.

approximately 25,000
metric tons per year.
We expect to build a
second furnace, which
will be in operation
after 2017.

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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.

	2010			2011			2012		
	(thousands of metric tons, except percentages)								
		Grade			Grade			Grade	
	Production	% Copper	% Nickel	Production	% Copper	% Nickel	Production	% Copper	% Nickel
Ontario operating mines									
Copper Cliff North	326	1.13	1.13	892	1.15	1.03	792	1.09	0.92
Creighton	426	2.65	3.10	991	1.72	2.22	797	1.80	1.84
Stobie(1)	775	0.59	0.69	1,568	0.61	0.74	2,006	0.56	0.66
Garson	246	2.16	1.60	640	1.78	2.08	643	1.56	1.61
Coleman	786	2.74	1.73	1,363	3.02	1.77	1,062	2.58	1.51
Ellen	86	0.56	0.75	131	0.45	0.90	371	0.44	0.93
Totten	16	2.54	1.74	28	1.01	0.97	6	2.37	1.15
Gertrude							36	0.27	0.72
Total Ontario operations	2,660	1.78%	1.53%	5,612	1.61%	1.45%	5,714	1.29%	1.14%
Manitoba operating mines									
Thompson	1,325		1.83	1,182		1.76	1,160		1.86
Birchtree(2)	832		1.41	721		1.36	643		1.34
Total Manitoba operations	2,158		1.67%	1,903		1.61%	1,804		1.67%
Voisey's Bay operating mines									
Ovoid	1,510	2.44	3.20%	2,366	2.39%	3.38%	2,351	1.94%	3.11%
Sulawesi operating mining areas									
Sorowako	4,176		2.00%	3,848		1.95%	3,678		2.02%
New Caledonia operating mines									
VNC	326		1.31%	1,043		1.29%	1,179		1.27%
Brazil operating mines									
Onça Puma	1,259		1.93%	1,466		1.86%	1,975		1.87%

(1) The Frood mine (which is part of the Stobie mine) was placed on care and maintenance status at the end of 2012.

(2) The Birchtree mine is currently being considered for care and maintenance status.

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The following table sets forth information about our nickel production, including: (i) nickel refined through our facilities, (ii) nickel further refined into specialty products and (iii) intermediates designated for sale. The numbers below are reported on an ore-source basis.

Mine	Type	Production for the year ended December 31, 2010	2011	2012
		(thousand metric tons)		
Sudbury(1)	Underground	22.4	59.7	65.5
Thompson(1)	Underground	29.8	25.0	24.2
Voisey's Bay(2)	Open pit	42.3	68.9	61.9
Sorowako(3)	Open cast	78.4	67.8	69.0
Onça Puma(4)	Open pit		7.0	6.0
New Caledonia(5)	Open pit		5.1	4.5
External(6)		5.9	8.0	5.9
Total(7)		178.7	241.5	237.0

(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, as well as some finished nickel produced by unrelated parties under toll-smelting and toll-refining arrangements.

(3) We have a 59.2% 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) Primary production only adjusted for the payable nickel amount. 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 2012, 51% of our total nickel sales were delivered to customers in Asia, 28% to North America, 19% to Europe and 2% 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, strips and foams); and
- size.

In 2012, the principal end-use applications for nickel were:

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

non-ferrous alloys, alloy steels and foundry applications (18% of global nickel consumption);

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nickel plating (8% of global nickel consumption); and

specialty applications, such as batteries, chemicals and powder metallurgy (8% of global nickel consumption).

In 2012, 67% 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, Kaohsiung (Taiwan), Bangkok (Thailand) and Bridgetown (Barbados). 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 14% of global consumption for primary nickel in 2012. 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"), BHP Billiton and Xstrata. Together with us, these companies accounted for about 49% of global refined primary nickel production in 2012.

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 41-46% of total nickel used for stainless steels, and primary nickel has accounted for about 54-59%. 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 2012, Chinese nickel pig iron and ferro-nickel production is estimated to have been greater than 300,000 metric tons, representing 20% of world primary nickel supply.

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 long-term agreements.	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. 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 follows the same processing and transportation model as Sossego.	Mining concession for indefinite period.	Supplied through the national electricity grid. Acquired from regional utility companies 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 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		
Chile						
Tres Valles	Coquimbo region, Chile	Two copper oxide mines: Don Gabriel, an open-pit mine, and Papomono, an underground mine, as well as an SX-EW plant that produces copper cathodes. Vale has 90.0% of the total capital and 100% of the voting capital, and the remaining is owned by Compañia Minera Werenfried.	We produce copper cathodes at the Tres Valles operation, located in Salamanca, in the Coquimbo region. The plant has an estimated annual production capacity of 18,500 metric tons of copper cathode (metal plate), and is our first industrial-scale cathode plant using a hydrometallurgical process.	Mining concession for indefinite period.	Supplied through the national electricity grid.	We truck the copper cathodes from the plant to a warehouse in the port of San Antonio.
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. (20%)	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, 2010	2011	2012
		(thousand metric tons)		
Brazil:				
Salobo	Open pit	-	-	13
Sossego	Open pit	117	109	110
Canada:				
Sudbury	Underground	34	101	79
Voisey's Bay	Open pit	33	51	42
Thompson	Underground	1	1	3
External(1)	-	22	31	29
Chile:				
Tres Valles	Open pit and underground	-	9	14
Zambia:				
Lubambe(2)	Underground	-	-	1
Total		207	302	290

(1) We process copper at our facilities using feed purchased from unrelated parties.
(2) Vale's attributable production capacity of 40%.

2.2.3 Customers and sales

Copper concentrates from Sossego are sold under medium- and long-term contracts to copper smelters in South America, Europe and Asia. We have long-term off-take agreements to sell the entire production of copper concentrates from the first phase of the Salobo project to smelters. We have long-term copper supply agreements with Xstrata Copper Canada for the sale of copper anodes and most of the copper concentrates produced in Sudbury. Copper concentrates from Voisey's Bay are sold under medium-term contracts to customers in Europe. Electrowon copper from Sudbury is sold 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, Freeport-McMoRan Copper & Gold Inc. ("Freeport-McMoRan"), Jiangxi Copper Corporation Ltd. and Xstrata, 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, the main producers are mining companies located in South America and Indonesia, 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, Freeport McMoRan, Antofagasta plc, Anglo American, Rio Tinto and Xstrata, operating at the parent-company level or through subsidiaries. Our market share in 2012 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 are Codelco, Anglo American and Xstrata, operating at the parent-company level or through subsidiaries.

2.3 Aluminum

We hold a 22% interest in Hydro, a major aluminum producer, which we account for on the equity method. In the past, we engaged in bauxite mining, alumina refining and aluminum smelting through subsidiaries in Brazil, our interests in which we transferred to Hydro in February 2011. We still own minority interests in MRN and Paragominas, which are bauxite mining businesses located in Brazil, and which we also account for on the equity method. We will transfer our remaining interest in Paragominas to Hydro in two equal tranches in 2014 and 2016.

2.4 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. 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 2012, PGM concentrates from our Canadian operations supplied about 53% 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 entered into an agreement with Silver Wheaton to sell 25% of the gold produced as a by-product at our Salobo copper mine, in Brazil, for the life of that mine and to sell 70% of the gold produced as a by-product at our Sudbury nickel mines, in Canada, for the next 20 years. See *Significant changes in our business.*

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

Mine(1)	Type	2010	2011	2012
		(thousand troy ounces)		
Sudbury:				
Platinum	Underground	35	174	134
Palladium	Underground	60	248	251
Gold	Underground	42	182	69
Salobo:				
Gold	Open pit	-	-	20
Sossego:				
Gold	Open pit	102	90	75

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

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2.5 Cobalt

We recover significant quantities of cobalt, classified as a minor metal, as a by-product of our nickel operations. In 2012, we produced 1,284 metric tons of refined cobalt metal at our Port Colborne refinery, 606 metric tons of cobalt in a cobalt-based intermediate product at our Thompson nickel operations in Canada, and our remaining cobalt production consisted of 452 metric tons of cobalt contained in other intermediate products (such as nickel concentrates). We are increasing our production of cobalt intermediate as a by-product of our nickel production at the VNC operations in New Caledonia, which is currently ramping up. 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.

The following table sets forth information on our cobalt production.

		Production for the year ended December 31,		
Mine	**Type**	**2010**	**2011**	**2012**
			(metric tons)	
Sudbury	Underground	302	593	589
Thompson	Underground	189	158	96
Voisey's Bay	Open pit	524	1,585	1,221
New Caledonia	Open pit		245	385
External sources(1)	-	51	93	52
Total		1,066	2,675	2,343

(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.

		Our share of capital		
Company	**Location**	**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., ammonium nitrate and urea). 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 ten 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; and Araucária, Paraná. In December 2012, we signed with Petrobras an agreement to sell Araucária operations for US$234 million, which is subject to certain conditions precedent, including approval by CADE.

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In addition to the phosphate and nitrogen operations of Vale Fertilizantes, since 2010 we have also operated the Bayóvar phosphate rock mine in Peru, which is expected to reach nominal capacity of 3.9 Mtpy by 2014 and is operated 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, 2010	2011	2012
		(thousand metric tons)		
Bayóvar	Open pit	791	2,544	3,209
Catalão	Open pit	626	947	1,026
Tapira	Open pit	2,068	2,011	2,068
Patos de Minas	Open pit	43	44	44
Araxá	Open pit	1,182	1,231	1,084
Cajati	Open pit	545	582	550
Total		5,255	7,359	7,982

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

Product	Production for the year ended December 31, 2010	2011	2012
	(thousand metric tons)		
Monoammonium phosphate (MAP)	898	823	1,201
Triple superphosphate (TSP)	788	811	913
Single superphosphate (SSP)	2,239	2,638	2,226
Dicalcium phosphate (DCP)	491	580	511
Ammonia	508	619	475
Urea	511	628	483
Nitric acid	454	468	478
Ammonium nitrate	447	458	490

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, 2010	2011	2012	Recovery rate
		(thousand metric tons)			(%)
Taquari-Vassouras	Underground	662	625	549	85.9

3.3 Customers and sales

All potash sales from the Taquari-Vassouras mine are to the Brazilian market. In 2012, our production represented approximately 6.9% 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 2012, our production represented approximately 34.9% of total phosphate consumption in Brazil, with imports representing 49.9% of total supply. In the high-concentration segment our production supplied more than 33% of total Brazilian consumption, with products like MAP and TSP. In the low-concentration phosphate nutrients segment our production represented approximately 38.2% of total Brazilian consumption, with products like SSP and DCP.

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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 94% 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, the United States, Russia and Tunisia) account for 76% of global production, of which roughly 10% is exported. However, higher value-added products such as MAP and DAP are usually traded instead of phosphate rock due to cost efficiency.

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 6.88 Mtpy of KCl (potassium chloride) in 2012, 2.6% lower than 2011, from Canadian, Belarussian, German, Israeli, and Russian producers, in descending order. In terms of global consumption, China, the United States, Brazil and India represent 59% of the total, with Brazil alone representing 16% 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 17% of total phosphate rock production. Major phosphate rock exporters are concentrated in North Africa, mainly through state-owned companies, with Moroccan OCP Group holding 34% of the total seaborne market. Brazil imports 50% 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 (NH_3), 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 12% of the ammonia produced worldwide is traded. North America is the main importer, accounting for 35% of global trade. Main exporting regions are Central America, Russia, Eastern Europe and the Middle East.

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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 following table.

Company	Business	Location	Our share of capital (%)		Partners
			Voting	Total	
Vale	Railroad (EFVM and EFC), port and maritime terminal operations	Brazil			
VLI	Railroad, port, inland terminal and maritime terminal operations. Holding of certain cargo logistics assets	Brazil	100.0	100.0	
FCA(1)	Railroad operations	Brazil	99.9	99.9	
FNS(1)	Railroad operations	Brazil	100.0	100.0	
MRS	Railroad operations	Brazil	46.8	47.6	CSN, Usiminas and Gerdau
CPBS	Port and maritime terminal operations	Brazil	100.0	100.0	
PTVI PTV	Port and maritime terminal operations	Indonesia	59.2	59.2	Sumitomo, public investors
Vale Logística Argentina	Port operations	Argentina	100.0	100.0	
CEAR(2)	Railroad	Malawi	43.4	43.4	Portos e Caminhos de Ferro de Moçambique, P.E.
CDN(3)	Railroad and maritime terminal operations	Mozambique	43.4	43.4	Portos e Caminhos de Ferro de Moçambique, P.E.
CLIN	Railroad and port operations	Mozambique	80.0	80.0	Portos e Caminhos de Ferro de Moçambique, P.E.
Vale Logistics Limited	Railroad operations	Malawi	100.0	100.0	
Transbarge Navigación	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 controls its interest in FCA and FNS through VLI.

(2) Vale controls its interest in CEAR through a 85% interest in SDCN.

(3) Vale controls its interest in CDN through a 85% interest in SDCN.

We created a subsidiary, VLI S.A. ("VLI"), to hold our general cargo business, including our interests in FCA and FNS, rights to use railroad transportation capacity on our EFVM and EFC railroads and other logistics assets. VLI provides integrated logistics solutions through 10,540 km of railroads (FCA, FNS, EFVM and EFC), four inland terminals with a total storage capacity of 220,000 t and three maritime terminals and ports operations. In 2012, VLI transported a total of 28.1 billion ntk of general cargo, including 14.8 billion ntk from FCA and FNS and 13.3 billion ntk through operational agreements with Vale. We are exploring the possibility of seeking one or more equity investors that would provide outside funding for VLI's capital requirements in exchange for an equity interest in the company. If we pursue such a transaction, we would expect to retain either control or significant influence over VLI.

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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. The EFVM railroad has a daily capacity of 342,000 metric tons of iron ore. In 2012, the EFVM railroad carried a total of 74.3 billion ntk of iron ore and other cargo, of which 67.0 billion ntk, or 90%, consisted of cargo transported for customers, including iron ore for Brazilian customers. The EFVM railroad also carried 0.9 million passengers in 2012. In 2012, we had a fleet of 322 locomotives and 19,111 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. It has a daily capacity of 311,707 metric tons of iron ore. In 2012, the EFC railroad carried a total of 103.3 billion ntk of iron ore and other cargo, 3.5 billion ntk of which was cargo for customers, including iron ore for Brazilian customers. EFC also carried 360,367 passengers in 2012. EFC supports the largest capacity train in Latin America, which measures 3.4 kilometers, weighs 41,640 gross metric tons when loaded and has 330 cars. In 2012, EFC had a fleet of 247 locomotives and 14,975 wagons.

Ferrovia Centro-Atlântica ("*FCA*"). Our subsidiary FCA 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 8,023 kilometers of track extending into the states of Sergipe, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro and Goiás and Brasília, 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 Santos Port in the state of São Paulo. In 2012, the FCA railroad transported a total of 12.4 billion ntk of cargo, essentially all of it for customers. In 2012, FCA had a fleet of 494 locomotives and 10,535 wagons.

Ferrovia Norte-Sul railroad ("*FNS*"). We have a 30-year renewable subconcession for the commercial operation of a 720-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 2012, the FNS railroad transported a total of 2.37 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 2012, FNS had a fleet of 38 locomotives and 587 wagons.

The principal items of cargo of the EFVM, EFC, FCA and FNS 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;
- agricultural products, such as soybeans, soybean meal and fertilizers; and
- other general cargo, such as building materials, pulp, fuel and chemical products.

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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*).

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 2012, the MRS railroad carried a total of 155.42 million metric tons of cargo, including 68.76 million metric tons of iron ore and other cargo from Vale.

Argentina

On August 24, 2010, through our subsidiary Potasio Río Colorado S.A., we executed an agreement with Ferrosur Roca S.A. for partial assignment, subject to governmental approvals, of a 756-kilometer railroad administrative concession. This concession is important to the support of the Rio Colorado potash project, which is currently under review.

Africa

We are developing the Nacala Corridor, which will connect Moatize site to the Nacala-à-Velha maritime terminal, located in Nacala, Mozambique. In July 2012, our subsidiary Corredor Logístico Integrado de Nacala ("CLIN") entered into two concession agreements with the Government of Mozambique with respect to greenfield railways and a new coal port, which will form part of the Nacala Corridor. In December 2011, our subsidiary Vale Logistics Limited ("VLL") entered into a concession agreement with the Republic of Malawi with respect to a 137-kilometer railroad to be built from Chikwawa to Nkaya Junction in Malawi. These concessions in Malawi and Mozambique will allow for the expansion of Moatize and facilitate the creation of a world-class logistics infrastructure to support our operations in Central and Eastern Africa. We will invest in the capacity expansion of the Nacala Corridor through the rehabilitation of the existing railroads in Mozambique and Malawi, respectively owned by Corredor de Desenvolvimento do Norte S.A. ("CDN") and the Central East African Railway Company Limited ("CEAR"), each a 51%-owned subsidiary of Sociedade de Desenvolvimento Corredor Nacala, SA ("SCDN"). 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 through CLIN. We continue to consider partnerships for the utilization and potential future development of the Nacala Corridor.

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 2012, 10% 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 three maritime terminals that we operate: (i) an iron ore maritime terminal, (ii) Praia Mole Terminal and (iii) Terminal de Produtos Diversos.

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 400,000 DWT at a time, limited at 20 meters draft plus tide. In Pier I there are two ship loaders, which can load up to a combined total of 26,700 metric tons per hour. In Pier II there are two ship loaders that work alternately and can each load up to 16,000 metric tons per hour. In 2012, 102.6 million metric tons of iron ore and iron ore pellets were shipped through the terminal for us. The iron ore maritime terminal has a stockyard capacity of 3.4 million metric tons.

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Praia Mole terminal is principally a coal terminal and handled 9.2 million metric tons in 2012. See *Additional information Legal proceedings*.

Terminal de Produtos Diversos handled 6.8 million metric tons of grains and fertilizers in 2012.

Ponta da Madeira maritime terminal. The Ponta da Madeira maritime terminal is located near the Itaqui Port 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 220,000 DWT at the south berth and 180,000 DWT at the north berth and has a maximum loading rate of 8,000 metric tons per hour in each shiploader. Pier IV (south berth) will be able to accommodate vessels of up to 420,000 DWT and will have 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. Other cargo includes manganese ore produced by us and pig iron and soybeans for unrelated parties. In 2012, 105.35 million metric tons of iron ore were handled through the terminal. The Ponta da Madeira maritime terminal has a stockyard capacity of 6.2 million metric tons, which will be expanded to 7.4 million metric 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 that allows the loading of ships up to 18 meters of draft and approximately 200,000 DWT of capacity. In 2012, the terminal uploaded 22.9 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 that allows the loading of ships of up to 350,000 DWT. In 2012, the terminal uploaded 39.7 million metric tons of iron ore.

Inácio Barbosa maritime terminal ("TMIB"). We operate the Inácio Barbosa maritime terminal, located in the Brazilian state of Sergipe. The terminal is owned by Petrobras. Vale and Petrobras are parties to an agreement , which provides for the operation of this terminal by Vale until December 2013. The parties are currently negotiating the extension of this agreement. In 2012, 1.1 million metric tons of petroleum coke, fertilizers and agricultural products were shipped through TMIB.

Santos maritime terminal ("TUF"). We operate 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 2012, the terminal handled 2.6 million metric tons of ammonia and bulk solids, in line with 2011.

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 stockyard of 20,000 square meters until October 2016 and an agreement with third parties for an extra stockyard of 27,000 square meters. We handled 1.7 million metric tons of iron and manganese ore through this port in 2012, which came from Corumbá, Brazil, via the Paraguay and Paraná rivers, for shipment to 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.

Indonesia

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

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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 Harapan Tanjung Mangkasa Special Port is located in Harapan Tanjung Mangkasa Village, South Sulawesi, with mooring buoys that can accommodate vessels displacing 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 stockyard 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.

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 2012, 25 of our vessels were in operation, including 11 Valemax vessels, with a capacity of 400,000 DWT each, and 14 vessels of Capesize capacity and over, with capacities ranging from150,000 to 250,000 DWT. We also leased 10 Valemax vessels under long-term contracts. We expect the delivery of eight more owned and six more leased Valemax vessels from Chinese and Korean shipyards in 2013. To support our iron ore delivery strategy, Vale owns and operates a floating transfer station at Subic Bay, Philippines that transfers iron ore from VLOCs 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 2012, we shipped 121.5 million metric tons of iron ore and pellets on a CFR basis.

In August 2012, we sold 10 large ore carriers to Polaris for US$600 million. These vessels were purchased by Vale in 2009 and 2010 and converted from oil tankers into ore carriers, each with a capacity of approximately 300,000 DWT, in order for Vale to have at its disposal a fleet of vessels dedicated to the transport of iron ore to its customers. The vessels sold were chartered back by Vale from Polaris under long-term charter contracts, which preserves Vale's capacity for maritime transportation of iron ore without ownership and operational risks.

In the Paraná and Paraguay waterway system, we transport iron ore and manganese ores through our subsidiary Transbarge Navigación, which transported 1.0 million tons through the waterway system in 2012, and our subsidiary Vale Logística Argentina, which loaded 1.0 million tons of ore at San Nicolas port into ocean-going vessels in 2012. In 2010, we also purchased two new convoys (two pushers and 32 barges) that will begin operations in 2013.

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).

4.1.4 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.

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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 2012, our installed capacity in Brazil was 1.1 GW. We use the electricity produced by these plants for our internal consumption needs. We currently have 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.

In June 2011, we acquired a 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. Our equity stake at Norte Energia gives us the right to purchase 9% of the electricity generated by the plant.

Canada

In 2012, our wholly-owned and operated hydroelectric power plants in Sudbury generated 11% 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 2012, average demand for electrical energy was 196 MW to all surface plants and mines in the Sudbury area.

In 2012, 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 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. The Karebbe plant helps reduce production costs by substituting oil used for power generation with hydroelectric power, reduce CO_2 emissions by replacing non-renewable power generation, and enables 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. 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 during the third quarter of 2010, and produced 3.4 Mt in 2012. 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 three other steel projects in Brazil, Companhia Siderúrgica do Pecém ("CSP"), which was already approved by our Board of Directors, as well as Aços Laminados do Pará ("Alpa") and Companhia Siderúrgica Ubu ("CSU"), which are both in earlier stages of development.

We own 31.3% of Log-In, which conducts intermodal logistics services. Log-In offers port handling and container transportation services by sea as well as container storage. It operates owned and chartered ships for coastal shipping, a container terminal (Terminal Vila Velha TVV) and multimodal terminals. In 2012, Log-In's coastal shipping service transported 198.565 twenty-foot equivalent units ("teus") and TVV handled 267.510 teus.

We also have an onshore and offshore hydrocarbon exploration portfolio in Brazil, which is currently under review.

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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 2012, we performed an analysis of our reserve estimates for certain projects and operations, which is reflected in new estimates as of December 31, 2012. Reserve estimates for each operation assume that we either have or will 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, 2012. 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(1):		
Lump ore Midwestern System	80.92	Average realized price
Pellet Samarco(2)	175.74	Average realized price
Pellet feed Southeastern System	125.51	Average realized price
Pellet feed Southern System	109.60	Average realized price
Sinter feed Northern System	117.77	Average realized price
Sinter feed Southeastern System	114.65	Average realized price
Sinter feed Southern System	109.50	Average realized price
Coal:		
Metallurgical Moatize	211.74	Medium volatile hard coking coal FOB Queensland (source: Platts)
Metallurgical Integra underground	160.96	Average realized semi hard coking coal price
Metallurgical Integra open cut	143.54	Average semi soft coking coal realized price
Metallurgical Carborough Downs	218.12	Average hard coking coal realized price
Metallurgical Isaac Plains	168.26	Average semi hard coking coal realized price
PCI Carborough Downs	169.20	Average PCI realized price
PCI Isaac Plains	141.88	Average PCI realized price
Thermal Integra open cut	92.52	Average thermal realized price
Thermal Isaac Plains	94.99	Average thermal realized price
Base metals:		
Nickel(3)	20,746	Average realized price
Copper	8,102	Average realized price
Nickel by-products:		
Platinum	1,649.83/ t oz	Average realized price
Palladium	702.63/ t oz	Average realized price
Gold	1,591.50/ t oz	Average realized price
Cobalt(3)	15.66/ lb	99.3% low cobalt metal (source: Metal Bulletin)
Fertilizer nutrients:		
Phosphate	165	Average benchmark price for phosphate concentrate, FOB Morocco (source: Fertilizer Week)
Potash	429	Average benchmark price for potash, FOB Vancouver (source: Fertilizer Week)
Other:		
Manganese lump ore	203.72	Average realized price
Manganese sinter feed	179.35	Average realized price

(1) Prices on an FOB Brazil basis.

(2) US$ per dry metric ton of iron ore pellets is used for pricing at Samarco, and we have adopted that pricing measure for Samarco's average historical prices.

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

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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 11% from 2011 to 2012, reflecting updated geological and reserve models to incorporate new drilling data for deposits at João Pereira, Abóboras, Capitão do Mato and Samarco (Alegria Norte/Centro and Alegria Sul), which more than offset mining depletion. In addition, we are disclosing reserves at Germano (Samarco) for the first time.

Summary of total iron ore reserves(1)

	Proven	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Southeastern System	2,050.1	49.1	1,268.1	49.0	3,318.3	49.1	3,508.3	49.4
Southern System	2,440.6	46.1	2,994.8	43.8	5,435.4	44.8	4,210.1	47.8
Midwestern System	7.2	62.7	26.4	62.1	33.6	62.2	34.9	62.2
Northern System	4,841.0	66.7	2,437.2	66.6	7,278.2	66.7	7,382.7	66.7
Vale Total	9,339.0	57.4	6,726.5	53.1	16,065.5	55.6	15,135.9	57.4
Samarco(2)	1,894.0	40.2	1,082.5	38.9	2,976.5	39.7	2,029.4	41.2
Total	11,233.0	54.5	7,809.0	51.1	19,042.0	53.1	17,165.3	55.5

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture content: Southeastern System 4%; Southern System 5%; Midwestern System 3%; Northern System 6%; and Samarco 6%. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Itabira site								
Conceição	503.5	45.9	104.1	47.7	607.5	46.3	630.5	46.4
Minas do Meio	217.9	51.7	77.8	48.3	295.7	50.8	317.4	50.9
Minas Centrais site								
Água Limpa(2)	25.0	42.1	8.0	42.3	33.0	42.2	44.2	41.9
Gongo Soco							50.8	66.6
Brucutu	227.8	50.7	273.6	48.5	501.4	49.5	535.7	49.8
Apolo	292.4	57.4	339.7	55.1	632.1	56.1	632.1	56.1
Mariana site								
Alegria	131.7	48.7	26.1	46.3	157.8	48.3	166.5	48.7
Fábrica Nova	425.5	45.3	345.5	44.0	770.9	44.7	800.1	45.0
Fazendão	226.4	49.8	93.4	50.1	319.8	49.9	330.9	49.9
Total Southeastern System	2,050.1	49.1	1,268.1	49.0	3,318.3	49.1	3,508.3	49.4

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture content: Itabira site 2%; Minas Centrais site 7%; Mariana site 4%. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Minas Itabiritos site								
Segredo	150.7	51.7	98.5	44.4	249.2	48.8	294.3	49.8
João Pereira	670.9	41.2	340.3	40.9	1,011.2	41.1	517.4	41.8
Sapecado	342.0	46.0	208.0	42.9	550.0	44.8	563.0	45.0
Galinheiro	563.1	45.4	410.5	43.8	973.6	44.7	980.9	44.7
Vargem Grande site								
Tamanduá	58.8	60.3	353.5	47.5	412.3	49.4	489.3	52.7
Capitão do Mato	238.1	52.0	960.0	45.4	1,198.1	46.7	747.5	51.8
Abóboras	320.2	42.1	604.4	40.2	924.6	40.8	440.8	44.4
Paraopeba site								
Jangada	29.5	66.8	13.6	66.3	43.1	66.6	48.1	66.7
Córrego do Feijão							30.7	66.6
Capão Xavier	67.3	65.1	6.0	64.2	73.3	65.0	81.2	65.0
Mar Azul							16.8	58.1
Total Southern System	2,440.6	46.1	2,994.8	43.8	5,435.4	44.8	4,210.1	47.8

(1) Tonnage is stated in millions of metric tons of wet run-of-mine. Grade is % of Fe, based on the following moisture content: Minas Itabiritos site 5%; Vargem Grande site 5%; Paraopeba site 4%. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Urucum	7.2	62.7	26.4	62.1	33.6	62.2	34.9	62.2
Total Midwestern System	7.2	62.7	26.4	62.1	33.6	62.2	34.9	62.2

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

(2) We are conducting a review of Corumbá's reserve model.

(3) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture content: 3%. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Serra Norte site								
N4W	1,128.4	66.5	277.1	66.1	1,405.5	66.5	1,446.2	66.5
N4E	258.2	66.5	86.9	66.0	345.1	66.4	364.2	66.4
N5	265.6	67.0	715.0	67.3	980.6	67.2	1,025.3	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	4,841.0	66.7	2,437.2	66.6	7,278.2	66.7	7,382.7	66.7

(1) Tonnage is stated in millions of metric tons of wet run-of-mine, based on the following moisture content: Serra Norte 8%; Serra Sul 5%; Serra Leste 4%. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Samarco								
Alegria Norte/Centro	1,073.8	42.1	706.7	40.2	1,780.5	41.4	1,229.3	42.5
Alegria Sul	761.4	37.6	354.4	36.2	1,115.8	37.1	800.1	39.1
Germano	58.8	39.7	21.4	39.8	80.2	39.8		
Total Samarco	1,894.0	40.2	1,082.5	38.9	2,976.5	39.7	2,029.4	41.2

(1) Tonnage is stated in millions of metric tons of wet run-of-mine based on the following moisture content: 7%. Grade is % of Fe. Approximate drill hole spacings used to classify the reserves were: Alegria Norte/Centro, 150m × 100m to proven reserves and 200m × 300m 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	2024	100.0
Fábrica Nova	Open pit	2005	2034	100.0
Fazendão	Open pit	1976	2044	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	2037	100.0
Galinheiro	Open pit	1942	2036	100.0
Vargem Grande site				
Tamanduá	Open pit	1993	2039	100.0
Capitão do Mato	Open pit	1997	2058	100.0
Abóboras	Open pit	2004	2050	100.0
Paraopeba site				
Jangada	Open pit	2001	2017	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	2034	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

No new manganese ore reserves were added in 2012. The operating lifetime and projected exhaustion date of the manganese mines are shown below. The exhaustion date for Urucum mine was extended to 2024 after taking into account the new mining plan, and the exhaustion date for Morro da Mina was extended to 2053 based on the actual production level going forward.

	Manganese ore reserves(1)(2)							
	Proven	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Azul	33.9	40.3	8.1	39.5	42.0	40.2	45.4	40.5
Urucum	0.0	0.0	5.9	45.1	5.9	45.1	6.2	45.1
Morro da Mina	8.76	25.3	5.8	24.8	14.6	25.1	14.8	25.1
Total	42.7	37.3	19.8	36.9	62.5	37.1	66.5	37.5

(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	2024	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 mining 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. Some of our coal reserve estimates were prepared by the following independent consultants: IMC Mining Services (Integra Coal Open Cut and Integra Underground) and Echelon Mining services (Isaac Plains), each of which has consented to the inclusion of these estimates herein.

		Coal ore reserves(1)(2)					
	Coal type	Proven	2012 Probable	2012 Total	2012	Total	2011
			(tonnage)	(tonnage)	(calorific value)	(tonnage)	(calorific value)
Integra Coal:							
Integra Open-cut(3)(4)	Metallurgical & thermal	16.4	4.6	21	30.1	24.8	29.9
Integra Underground Middle Liddell Seam	Metallurgical	3.1	5.6	8.7		10.7	
Integra Underground Hebden Seam	Metallurgical		30.8	30.8		30.8	
Total Integra Coal		19.5	41.0	60.5		66.3	
Carborough Downs Underground(5)	Metallurgical & PCI	25.6	1.9	27.5	31.2 (PCI)	40.3	31.7 (PCI)
Isaac Plains North Open Cut	Metallurgical, PCI & thermal	14.3	1.2	15.5	30.1 (PCI) 28.3 (thermal)	18.6	31.0 (PCI) 27.8 (thermal)
El Hatillo	Thermal				(thermal)	46.7	25.8
Moatize(6)	Metallurgical & thermal l	300.4	1,198.2	1,498.6	25.9	951.9	27.2
Total		359.8	1,242.3	1,602.1		1,123.8	

(1) 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 in-situ 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.

(2) 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.

(3) We determined the calorific value based on a theoretical ash versus calorific value curve.

(4) ROM moisture has been adjusted upwards year on year from 5.5% to 7.0%.

(5) 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.

(6) In early 2013, the Mozambican authorities approved a new land use license that effectively reduces the area available for future mining works and consequently will limit our reserves. We are evaluating the impact but expect a reduction of 10% to 20% in our reported reserves at Moatize.

Reserves at Integra Open Cut, the Middle Liddell Seam for Integra Underground, Carborough Downs and Isaac Plains decreased in 2012 due to mining depletion. Reserves for the Hebden Seam for Integra Underground remained the same. Total Moatize ROM reserves increased 57% from 2011 to 2012 reflecting updated geological models, which incorporated new drilling data, and revised mining lay-outs. However, its life of mine decreased consistently with the planned production expansion from Moatize II. The sale of Colombian thermal coal assets explains the remaining yearly change in coal reserves.

Coal mines				
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Integra Coal:				
Open-cut	Open pit	1991	2019	61.2
Middle Liddell Seam	Underground	1999	2016	61.2
Hebden Seam	Underground		2027	61.2
Carborough Downs	Underground	2006	2020	85.0
Isaac Plains	Open pit	2006	2019	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 mining 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Canada								
Sudbury	57.8	1.19	40.1	1.12	97.9	1.16	105.4	1.18
Thompson	6.2	1.93	19.4	1.69	25.6	1.74	27.5	1.75
Voisey's Bay	16.3	2.78	3.2	0.67	19.5	2.43	21.8	2.50
Indonesia								
PTVI	65.8	1.84	39.1	1.70	104.8	1.78	109.4	1.79
New Caledonia								
VNC	101.3	1.34	21.2	1.89	122.5	1.44	126.8	1.44
Brazil								
Onça Puma	47.2	1.73	35.2	1.23	82.4	1.52	82.9	1.52
Total	294.6	1.58	158.2	1.45	452.7	1.53	473.8	1.54

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

In Canada, reserves at our Sudbury operations decreased primarily due to mining depletion and changes to our mining plans at Creighton Mine, Copper Cliff Mine and Totten Project. Reserves at our Thompson and Voisey's Bay operations decreased due to mining depletions. Reserves at PTVI decreased as a result of mining depletion and minor changes to our mining plans, while revisions to ore models and pit designs partially offset these losses. Mineral reserves at VNC changed slightly from 2011 due to a new plant production schedule and minor mining depletions. Reserves at Onça Puma decreased marginally due to mining depletions.

	Nickel ore mines			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Canada				
Sudbury	Underground	1885	2040	100.0
Thompson	Underground	1961	2026	100.0
Voisey's Bay	Open pit	2005	2023	100.0
Indonesia				
PTVI	Open pit	1977	2035	59.2
New Caledonia				
VNC	Open pit	2011	2042	80.5
Brazil				
Onça Puma	Open pit	2011	2048	100.0

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Copper ore reserves

Our copper 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.

	Copper ore reserves(1)							
	Proven	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Canada								
Sudbury	57.8	1.55	40.1	1.37	97.9	1.48	105.4	1.51
Voisey's Bay	16.3	1.56	3.2	0.37	19.5	1.36	21.8	1.39
Brazil								
Sossego	132.62	0.81	18.06	0.69	150.68	0.79	154.1	0.81
Salobo	636.75	0.77	485.8	0.66	1,122.6	0.72	1,112.8	0.69
Total	843.47	0.85	547.16	0.71	1,390.7	0.79	1,394.1	0.78

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

In Canada, our copper ore reserve estimates decreased for the same reasons discussed above in connection with nickel reserves, since these deposits are polymetallic. In Brazil, reserves at Sossego have decreased from last year due to mine depletions, partially offset by new drilling results that increased the mineral reserves and changes on pit optimization parameters. The increase of reserves at Salobo is due to an updated resource estimation, pit optimization parameters and changes on life of mining plan. The Salobo mine is currently ramping up.

	Copper ore mines			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Canada				
Sudbury	Underground	1885	2040	100.0
Voisey's Bay	Open pit	2005	2023	100.0
Brazil				
Sossego	Open pit	2004	2023	100.0
Salobo	Open pit	2012	2043	100.0

PGMs and other precious metals reserves

We expect to recover significant quantities of precious metals as by-products of our Sudbury operations, Sossego and Salobo. 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Canada								
Sudbury								
Platinum	57.8	0.7	40.1	1.1	97.9	0.8	105.4	0.8
Palladium	57.8	0.9	40.1	1.2	97.9	1.0	105.4	1.1
Gold	57.8	0.3	40.1	0.4	97.9	0.4	105.4	0.4
Brazil								
Sossego								
Gold	132.62	0.24	18.06	0.19	150.68	0.23	154.1	0.2
Salobo								
Gold	636.75	0.42	485.8	0.32	1,122.6	0.38	1,112.8	0.43
Total Gold	942.8	0.43	624.2	0.43	1,567.0	0.43	1,583.1	0.47

(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 decreased for the reasons discussed above in connection with nickel reserves. In Brazil, reserves at Sossego and Salobo have decreased from last year, both in line with changes in copper reserves mentioned above.

	Precious metals mines			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Canada				
Sudbury	Underground	1885	2040	100.0
Brazil				
Sossego	Open pit	2004	2023	100.0
Salobo	Open pit	2012	2043	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 mining 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	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Canada								
Sudbury	57.8	0.04	40.1	0.03	97.9	0.04	105.4	0.04
Voisey's Bay	16.3	0.13	3.2	0.03	19.5	0.12	21.8	0.12
New Caledonia								
VNC	101.3	0.12	21.2	0.08	122.5	0.11	126.8	0.11
Total	175.4	0.09	64.5	0.05	239.9	0.08	254.0	0.08

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

Our cobalt reserve estimates decreased in 2012 for the reasons discussed above in connection with nickel reserves.

	Cobalt ore mines			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Canada				
Sudbury	Underground	1885	2040	100.0
Voisey's Bay	Open pit	2005	2023	100.0
New Caledonia				
VNC	Open pit	2011	2042	80.5

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Phosphate reserves

Our phosphate reserve estimates are of in-place material after adjustments for mining dilution, with no adjustments made for process recovery. The decrease in our phosphate reserve estimates reflects mine production and sales in 2012.

	Phosphate reserves(1)							
	Proven	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Bayóvar	223.5	17.2	1.9	15.9	225.4	17.2	230.9	17.2
Catalão	49.5	10.6	8.4	10.3	57.9	10.6	60.5	10.3
Tapira	245.6	7.2	445.6	6.7	691.2	6.8	717.3	6.7
Araxá	133.2	11.7	5.4	9.2	138.6	11.6	147.5	11.6
Cajati	72.5	5.6	47.5	4.6	120.0	5.2	125.4	5.1
Salitre	0	0	205.7	11.4	205.7	11.4	205.7	11.4
Total	724.3	11.2	714.5	8.0	1,438.8	9.58	1487.3	9.48

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

	Phosphate rock ore mine			
	Type	Operating since	Projected exhaustion date	Vale interest (%)
Bayóvar	Open pit	2010	2037	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 mining depletion and mining losses and recoveries, with no adjustments made for metal losses due to processing. We have not included our Rio Colorado potash project in proven and probable reserves, based on the circumstances of the project under current conditions. See *Significant changes in our business*. The Rio Colorado project is currently under review.

	Potash ore reserves (1)							
	Proven	2012	Probable	2012	Total	2012	Total	2011
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Taquari-Vassouras	6.8	28.0	3.0	28.0	9.8	28.0	11.5	28.0
Rio Colorado							360.8	34.2
Total	6.8	28.0	3.0	28.0	9.8	28.0	372.3	34.0

(1) Tonnage is before processing recovery.

Potash ore mines				
	Type	**Operating since**	**Projected exhaustion date**	**Vale interest (%)**
Taquari-Vassouras(1)	Underground	1986	2016	100.0

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

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CAPITAL AND R&D EXPENDITURES

We have an extensive program of investments in the organic growth of our businesses. The figures discussed in this section are for capital expenditures and research and development (R&D) expenses, which include mineral exploration and conceptual, pre-feasibility and feasibility studies, as well as development of new processes, technological innovation and adaptation.

During 2012, we made capital and R&D expenditures and other investments of US$17.729 billion, of which US$11.580 billion was organic growth, US$4.616 billion was invested in maintaining existing operations and US$1.533 billion was for R&D. The 2013 investment budget approved by our Board of Directors is US$10.126 billion for project execution, US$5.117 billion for sustaining existing operations and US$1.053 billion for R&D, which is comprised of US$382 million for mineral exploration, US$465 million for conceptual, pre-feasibility and feasibility studies and US$206 million to be invested in new processes, technological innovation and adaptation. Compared to the 2012 investment budget, the amount allocated in 2013 for project execution decreased by 22%, sustaining existing operations by 16% and R&D by 55%, reflecting a 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.

R&D expenses are recognized in the income statement when they are incurred, while capital expenditures are generally capitalized and then depreciated over the useful lives of the related assets. Investors seeking to compare the funds we generate with our funding requirements should bear that in mind.

A large part of the capital expenditure budget will be invested in Brazil (63.1%) and in Canada (14.4%). The remainder was allocated to investments in Australia, China, Indonesia, Malaysia, Malawi, Mozambique, New Caledonia, and Peru, among other countries.

	2011 expenditures (US$ million)	2012 expenditures (US$ million)	2013 budget (US$ million)	2013 budget (% of total)
Project execution	11,684	11,580	10,126	62.1
Investments to sustain existing operations	4,568	4,616	5,117	31.4
Research and development	1,742	1,533	1,053	6.5
Total	US$17,994	US$17,729	US$16,296	100.0%

The following table summarizes by major business area the breakdown of our capital and R&D expenditures in 2011 and 2012 and our investment budget for 2013.

	2011 (US$ million)	2011 (% of total)	2012 (US$ million)	2012 (% of total)	2013 budget (US$ million)	2013 budget (% of total)
Ferrous minerals	9,049	50.3	8,453	47.7	7,650	46.9
Coal	1,197	6.7	1,252	7.1	1,735	10.6
Base metals	4,082	22.7	4,179	23.6	3,783	23.2
Fertilizer nutrients	1,347	7.5	1,981	11.2	1,331	8.2
Logistics for general cargo(1)	446	2.5	600	3.4	532	3.3
Energy	820	4.6	388	2.2	271	1.7
Steel	460	2.6	366	2.1	520	3.2
Other	592	3.3	511	2.9	475	2.9
Total	US$17,994	100.0%	US$17,729	100.0%	US$16,296	100.0%

(1) Investments in logistics dedicated to a particular business segment are included with that segment in our capital expenditure data.

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Vale is developing a focused organic growth portfolio, with fewer projects but with higher expected rates of return. Our main initiatives are responsible for 70% of the US$10.126 billion budgeted for project execution in 2013. These programs include:

- the Carajás expansion of our top-quality integrated iron ore operations in the Northern System;
- the Itabiritos projects, involving capacity replacement, increase and quality improvement in the iron ore from the Southern/Southeastern Systems;
- the expansion of our global logistics distribution network of distribution centers, floating transfer stations, ships and barges;
- the construction and ramp-up of our world-class integrated Moatize/Nacala coal operations;
- the Salobo project, which increases our exposure to copper and gold; and
- the Long Harbour integrated nickel hydrometallurgical processing plant, with cleaner and more efficient operations than our conventional processing facilities.

The following table sets forth total expenditures in 2012 for our main investment projects and expenditures budgeted for those projects in 2013, together with estimated total expenditures for each project and the estimated start-up date of each project as of December 31, 2012.

Business area	Main projects(1)	Estimated Start-up	Executed CAPEX 2012(2)	Executed CAPEX Total	Expected CAPEX 2013	Expected CAPEX Total(3)
				(US$ million)		
Iron ore mining and logistics	Carajás Additional 40 Mtpy	2H13	957	2,473	548	3,475
	CLN 150 Mtpy	1H13 to 2H14	1,013	3,261	498	4,114
	Carajás Serra Sul S11D	2H16	739	1,813	658	8,039
	Serra Leste	2H14	149	292	166	478
	Conceição Itabiritos	2H13	228	781	208	1,174
	Vargem Grande Itabiritos	1H14	487	916	518	1,645
	Conceição Itabiritos II	2H14	265	424	197	1,189
	Cauê Itabiritos	2H15	98	119	206	1,504
	Teluk Rubiah	1H14	298	513	443	1,371
Pellet plants	Tubarão VIII	2H13	277	889	158	1,088
	Samarco IV(4)(5)	1H14				1,693
Coal mining and logistics	Moatize II	2H15	383	456	344	2,068
	Nacala Corridor	2H14	371	409	1,079	4,444
Copper mining	Salobo I(6)	1H12	294	2,290	123	2,507
	Salobo II	1H14	407	760	401	1,707
	Lubambe(6)(7)	2H12	21	77	13	235
Nickel mining and refining	Long Harbour	2H13	1,457	3,156	1,094	4,250
	Totten	2H13	138	540	171	759
Energy	Biodiesel	2015	83	427	75	633
Steelmaking	CSP(5)	2H15	294	576	439	2,648

(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) Budget fully funded by Samarco.

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

(6) Projects delivered in 2012.

(7) Expected CAPEX is relative to Vale's stake in the project. Executed CAPEX figures include Vale's direct contribution only, not including debt-financed amounts.

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The paragraphs below describe the status of each project as of December 31, 2012 and have not been updated to reflect any developments after that date.

Bulk materials and logistics projects

Iron ore mining and logistics projects:

Carajás Additional 40 Mtpy. Construction of an iron ore dry processing plant located in Carajás, in the Brazilian state of Pará, with an estimated nominal capacity of 40 Mtpy. The project is in the final stage of electromechanical assembly of the processing plant and loading line. Assembly of the steel structure for the screening phase has concluded. The project is 85% complete, with total realized expenditures of US$2.5 billion. The issuance of an operating license and the start-up are expected for the second half of 2013.

CLN 150 Mtpy. Expansion of Northern System railway and port capacity, including the construction of a fourth pier at the Ponta da Madeira maritime terminal in the Brazilian state of Maranhão. The project will increase EFC's logistics nominal capacity to approximately 150 Mtpy. The first ship was berthed and first ship loader test of Pier IV was completed. We have already performed operational tests with the car dumpers, reclaimers and a stacker, and we have concluded the rail access to the car dumpers. One of the required railway installation environmental licenses was issued in November 2012. The project is 86% complete, with total realized expenditures of US$3.3 billion. The start-up is expected from the first half of 2013 through the second half of 2014.

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 have already finished construction of the access road. We are continuing the off-site assembly of modules and receiving equipment for the truckless mining system. We received the preliminary environmental license in June 2012, and we expect the installation license to be issued in the first half of 2013. The project is 41% complete, with total realized expenditures of US$1.8 billion. The start-up is expected for the second half of 2016. In addition, we will submit the CLN S11D project for approval of our Board of Directors, which consists of the construction of a rail spur, the expansion of the Northern System railway, acquisition of wagons and locomotives and onshore and offshore expansions at Ponta da Madeira maritime terminal. The project is expected to increase the Northern System logistics capacity to 230 Mtpy and has an estimated total capital expenditure of US$11.4 billion.

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 road and railroad construction are in progress; we are continuing the civil engineering and assembly of steel structures of the beneficiation plant. The installation license has already been issued. The project is 59% complete, with total realized expenditures of US$292 million. We have redefined the start-up to the second half of 2014, in order to alleviate pressure on resources.

Conceição Itabiritos. Construction of a concentration plant, located in the Southeastern System, with estimated nominal additional capacity of 12 Mtpy. The project is in the final phase of electromechanical assembly and the issuance of the operating license for the plant is expected for the first half of 2013. The project is 95% complete, with total realized expenditures of US$781 million. The start-up is expected for the second half of 2013.

Vargem Grande Itabiritos. Construction of a new iron ore treatment plant in the Southern System, with an estimated nominal additional capacity of 10 Mtpy. The installation license has been issued. The civil engineering work of the main operational areas was finalized and the installation of steel structures for the screening building is in progress. The project is 76% complete, with total realized expenditures of US$916 million. The start-up is expected for the first half of 2014.

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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. The assembly of the mills is in progress and commissioning of the hematite primary crushing has been concluded. The project is 58% complete, with total realized expenditures of US$424 million. The start-up is expected for the second half of 2014.

Cauê Itabiritos. Adaptation of the plant to process low-grade itabirites, located in the Southeastern System. The earthworks and civil work are in progress. The project has an estimated nominal capacity of 24 Mtpy, with net additional capacity of 4 Mtpy in 2017. The preliminary and the installation environmental licenses for new primary crusher are expected for the first half of 2014. The project is 15% complete, with total realized expenditures of US$119 million. The start-up is expected for the second half of 2015.

Teluk Rubiah. Construction of a maritime terminal with enough depth for the 400,000 dwt vessels and a stockyard in Teluk Rubiah, Malaysia. The stockyard will be capable of handling up to 30 Mtpy of iron ore products. The preliminary environmental license, construction and installation licenses have been issued. The operating license is expected to be issued in the first half of 2014. The earthworks are in final stage, and we are continuing the main jetty construction, with majority of the piles driven. The project is 54% complete, with total realized expenditures of US$513 million. The start-up is expected for the first 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. The assembly of furnace refractory was finalized. The assembly and commissioning of the equipment are in progress. The issuance of the operating license is expected for the first half of 2013. The plant is 91% complete, with total realized expenditures of US$889 million. The start-up is expected for the second half of 2013.

Samarco IV. Construction of Samarco's fourth pellet plant with a nominal capacity of 8.3 Mtpy, a concentrator with a nominal capacity of 10.5 Mtpy, a pipeline with a nominal capacity of 20 Mtpy, and expansion of related mine and maritime terminal infrastructure. The mechanical equipment, steel structure assembly and civil engineering work are in progress. We achieved 71% of physical progress of the pellet plant. The budget is fully sourced by Samarco. The start-up is expected for the first half of 2014.

Coal mining and logistics projects:

Moatize II. New pit and duplication of the Moatize 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. Civil engineering work in the stockyard and primary crusher are ongoing. The project is 27% complete, with total realized expenditures of US$456 million. The start-up is expected for 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 project has an estimated nominal capacity of 18 Mtpy. Earthwork services on rail spur and onshore port are ongoing. We have completed detailed engineering of the port offshore construction, and are receiving offshore equipment for the port construction. The projects for railway and port are 12% and 15% complete, respectively, with total realized expenditures of US$409 million. The start-up is expected for the second half of 2014.

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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 completed civil engineering work of floating, milling and crushing, and are progressing on the electromechanical assembly of equipment in these areas. The plant operating license is expected for the first half of 2014. The project is 68% complete, with total realized expenditures of US$760 million. The start-up is expected for the first half of 2014.

Nickel mining and refining projects:

Long Harbour. Construction of a hydrometallurgical facility in Long Harbour, Newfoundland and Labrador, Canada. The plant will have an estimated nominal capacity of refining 50,000 tpy of finished nickel, and associated copper and cobalt. The project is 84% complete, with total realized expenditures of US$3.156 billion. The infrastructure and civil engineering work are substantially complete. The project is moving towards final stages of electromechanical assembly and commissioning. The start-up is expected for the second half of 2013.

Totten. Nickel mine (re-opening) in Sudbury, Ontario, Canada. The project has an estimated nominal capacity of 8,200 tpy. We have completed the return air raise and mine dewatering systems. The project is 76% complete, and US$540 million of expenditures have been realized. The start-up is expected for the second half of 2013.

Fertilizer nutrients projects

Rio Colorado. Investments in a solution mining system, located in Mendoza, Argentina, including the renovation of railway tracks (440 km), construction of a railway spur (350 km) and a maritime terminal in Bahia Blanca, Argentina. The project has an estimated nominal capacity of 4.3 Mtpy of potash (KCl). In December 2012, the project was 45% complete, with total realized expenditures of US$2.229 billion. 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 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.

Energy projects

Biodiesel. Project to produce biodiesel from palm oil. Plantation of 80,000 hectares of palm trees located in the Brazilian state of Pará, with an estimated nominal capacity of 360,000 tpy of biodiesel. The first palm oil plant has been commissioned and is operating. We are currently conducting earthworks for biodiesel plant and second palm oil plant. The installation license is expected for the second half of 2013 and the operating license for the second half of 2015. US$427 million of expenditures have been realized.

Steel projects

Companhia Siderúrgica do Pecém ("CSP"). Development of a steel slab plant in the Brazilian state of Ceará in partnership with Dongkuk Steel Mill Co. ("Dongkuk") 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 earthworks on site are final stage and pile driving is in progress. We have already obtained preliminary environmental and installation licenses. US$576 million of expenditures have been realized. The start-up is expected for 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 also subject to extensive regulation, and in order to conduct mining activities, we are generally required to obtain and maintain some form of governmental 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. For example in many jurisdictions, including Brazil, mineral resources belong to the State and may only be exploited pursuant to a governmental concession. In other jurisdictions, including Canada, a substantial part of our mining operations is conducted pursuant to mining rights we own or pursuant to leases, often from government agencies. 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 6.07 million hectares in Brazil and 12.4 million hectares in other countries.

Location	Concession or other right	Approximate area covered (in hectares)	Expiration date
Brazil	Mining concessions (including applications)	660,715	Indefinite
Canada	Mining concessions (terminology varies among provinces)	275,764	2013-2033(1)
Indonesia	Contract of work	190,510	2025(2)
Australia	Mining leases	19,200	2015-2041
New Caledonia	Mining concessions	21,269	2015-2051
Peru	Mining concessions	153,968(3)	Indefinite
Argentina	Mining concessions	167,073	Indefinite
Chile	Mining concessions	64,697	Indefinite
Mozambique	Mining concessions	23,780(4)	2032
Guinea	Mining concessions	102,400	2035

(1) Certain mining concessions are for an indefinite period.

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

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

(4) 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. The Brazilian government is planning to propose changes to the Brazilian Mining Code, which if adopted may have important implications for our mining operations in Brazil or require additional capital expenditures.

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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. PTVI does not currently hold any licenses under the IUP regime. In September 2012, PTVI started the renegotiation of its contract of work, as required by the 2009 mining law. The Indonesian government intends to adjust the size of the area, the term and form of contract extension and financial obligations (royalties and taxes), and it seeks to introduce domestic processing and refining requirements and priority for use of domestic goods and services. PTVI has provided its position on each of these points, and the negotiation is expected to be completed by December 2013. In 2012, the Indonesian government also established a new tax regime for raw ore exports.

New Caledonia. A mining law passed in 2009 requires mining projects to obtain authorization, rather than a declaration, from governmental authorities. We submitted an application for authorization (replacing the 2005 mining declaration) in April 2012, and the authorities may take up to three years to issue the authorization. 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.

Guinea. A mining code adopted in 2011 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 new 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. Additionally, the Government of Guinea has launched a contract review process which purports to harmonize existing mining contracts with the new mining code. According to the regulations adopted by the Government, the contract review process may result in the cancellation or the renegotiation of mining rights depending on the findings and the recommendations of the technical committee responsible for conducting the contract review process. Our subsidiary's mining project in Guinea is currently being reviewed by the technical committee, which has initiated a comprehensive investigation into the conditions under which our subsidiary's mining rights in Guinea were granted and have been operated before and after our investment in the project. Until this review process is completed and the legal uncertainty relating to the application of the new mining code to existing projects is clarified, we will be unable to determine how and to what extent our subsidiary in Guinea will be affected. Our subsidiary has recently decided to put its Guinean operations on hold pending resolution of the regulatory uncertainties affecting the project.

Mozambique. The government completed a new mining code proposal in December 2012 that will be submitted to Parliament for approval. 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, a new resettlement regulation enacted in June 2012 contains stricter requirements that may result in increased costs and delays in the implementation of our projects.

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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. The Brazilian government is preparing to propose changes in the CFEM regime. Any changes must be incorporated into a final proposal by the DNPM, which is then subject to approval by the Brazilian National Congress. We are currently engaged in several administrative and legal proceedings alleging that we have failed to pay the proper amount of CFEM. See *Additional information Legal proceedings CFEM-related proceedings*.

Brazilian states. The Brazilian states of Minas Gerais and Pará introduced a tax on mineral production (*Taxa de Fiscalização de Recursos Minerais* TFRM) in December 2011. In 2012, those states implemented legislative changes that reduced the amounts due under the TFRM (i) from R$6.906 to R$2.302 per metric ton of mineral produced in the state of Pará, and (ii) from R$2.3291 to R$0.9316 per metric ton of mineral transferred or sold in the state of Minas Gerais. Vale paid the TRFM due in 2012. A Brazilian industry association (Confederação Nacional da Indústria CNI) is currently challenging the constitutionality of the TFRM imposed by Minas Gerais and Pará before the Brazilian Supreme Court. If the CNI's claim is successful, we believe that the TFRM could be eliminated. In December 2012, a similar TFRM was introduced by the state of Mato Grosso do Sul, and we are currently evaluating whether to challenge it.

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, its nickel production from the concession area. The royalty payment was based on sales volume (US$78 per metric ton of contained nickel matte, and US$140 per metric ton for a total production below 500 tons or US$156 per metric ton for a total production above 500 tons of contained cobalt below or above 500 tons, respectively). In 2012, the royalty payment was equal to 0.54% of revenues from the sale of nickel in matte products, while the average yearly royalty payment for the period from 2009 to 2012 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 mlbs in 2010.

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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 (less the mineral resource rent tax ("MRRT")) for a mining lease holder who pays a MRRT installment during the relevant period. 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. The difference between the MRRT and royalties paid to each state government is that the royalties are based on the volume and value of the resource, whereas the MRRT is based on profits. However, companies will be given a credit for any state-based royalties paid where the MRRT is payable. For the year ended December 31, 2012, Vale Australia was not liable for any MRRT.

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 additional 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 development 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, natural caverns, 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, starting in June 2013 we expect to start acquiring permits under a recently-introduced carbon pricing scheme which will operate initially like a carbon tax with a fixed (but increasing) carbon permit price.

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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 (*Agência Nacional de Transportes Terrestres 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. We also own 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. In January 2012, ANTT changed the regulation of tariffs charged by rail concessionaires and reduced the ceiling for tariffs. Those changes have not significantly affected our contracts.

Brazilian port regulation. Port operations in Brazil are subject to regulation and supervision by ANTAQ, the federal agency in charge of maritime transportation, and SEP, the Brazilian Ministry of Transportation's department for ports. In December 2012, a provisional measure approved by the Brazilian government established new rules for new projects and existing terminals. This measure removed certain restrictions on servicing third party cargo and permitted ANTAQ's involvement in determining third party access to private terminals, different from the previous regime. Although the measure came into effect immediately, it still need to be confirmed by the Brazilian Congress, which could repeal, amend or approve it.

Regulation of chemicals. Some of our products are subject to regulations applicable to the marketing and distribution of chemicals and other substances. For example, the European Commission has adopted a European Chemicals Policy, known as REACH ("Registration, Evaluation, and Authorization of Chemicals"). Under REACH, manufacturers and importers were required to register new 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 restrictions to commercialize its products in Europe. We have complied with registration requirements for the substances we import into or manufacture in the EU in 2012 and continue to take measures to manage our exposure to the authorization process.

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II. OPERATING AND FINANCIAL REVIEW AND PROSPECTS

OVERVIEW

The year 2012 was challenging for the global economy, with a second consecutive year of low growth. One of the consequences of the adverse macroeconomic environment was a general decline in prices for minerals and metals, with the exception of gold. Iron ore prices were much more volatile than in previous years, particularly showing high downward volatility in the third quarter of the year.

Our iron ore and pellet shipments reached an all-time high of 303.4 million metric tons. In addition to the sales increase, our iron ore marketing strategy based on the utilization of a global distribution network is contributing to our ability to capture more value through higher sales prices.

We have begun to deliver on several major commitments we have made. First, we have made progress in environmental permitting, with more than 100 licenses obtained in Brazil. These will allow for the uninterrupted continuation of our operations and the execution of important projects, such as Carajás Serra Sul S11D, which will mean an increased supply of iron ore at lower costs and higher quality, creating more value and strengthening our undisputed leadership in the global market. Simultaneously, we have been gradually solving issues related to tax litigation, which is an important advance, as it eliminates financial risks and frees resources to focus our attention on managing the business.

The successful ramp-up of projects will be critical to realize the large upside in the performance of our base metals business, alongside various initiatives being developed to extract maximum value from existing operations. The ramp-up of Moatize, Oman I & II and Bayóvar allowed for record output of coal, pellets and phosphate rock. Iron ore production in the fourth quarter of 2012 was the biggest for a fourth quarter, helping to amplify our exposure to the V-shaped recovery of iron ore prices that has been taking place since mid-September 2012.

Two new copper projects commenced operations in 2012: Salobo and Lubambe. Salobo, in Carajás, is a world-class copper with gold operation. Lubambe, developed through a joint venture, is our first copper mine in the heart of the rich African copper belt, the area with the largest growth potential in the world for copper supply expansion. VNC, our nickel and cobalt project in New Caledonia, is ramping up and proving to be technically feasible. The operation of the second line began in 2013, and we will soon be able to assess its economic viability.

Innovation is becoming an important driver of competitiveness in the global mining industry. The CORe project was implemented at the Sudbury operations, involving a simpler flowsheet with lower operating costs and higher metal recovery. Long Harbour, in Canada, is expected to come on stream in 2013, with a new technological approach to nickel production. It has an integrated hydrometallurgical flowsheet, which entails lower costs, higher efficiency and elimination of emission of SO2 and particulates. The use of truckless mining in our future operations at Serra Sul S11D is another major technological change that also reconciles the goals of cost minimization and sustainability.

We are actively pursuing initiatives to lower our cost structure on a permanent basis, although some time will be needed to show a material difference from the past. We strongly believe that we are on track to deliver, and some early progress can already be seen in 2012 SG&A expenses and costs for materials and outsourced services, two important cost items.

Health and safety are key company priorities, together with sustainability and support for the communities where we operate. The frequency of accidents continues to decline, as we pursue a much safer environment for our employees. In 2012, we invested US$1.0 billion in environmental protection and conservation and US$318 million in social projects, destined to improve quality of life and to provide opportunities for social and economic mobility.

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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 2012, see *Information on the company Business overview Significant changes in our business*.

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

	Year ended December 31,		
	2010	**2011**	**2012**
	(thousand metric tons)		
Iron ore	254,902	257,287	258,061
Iron ore pellets	39,512	41,861	45,382
Manganese	1,119	1,032	1,745
Ferroalloys	401	386	267
Coal:			