

2011

Sustainability Report



Mission To transform natural resources into prosperity and sustainable development

.....

Vision To be the number one global natural resources company in creating long term value, through excellence and passion for people and the planet

.....

Values ▶ Life matters most
▶ Value our people ▶ Prize our planet ▶ Do what is right ▶ Improve together ▶ Make it happen

2011 Sustainability Report

Profile and global action 02
Message from the board 03
Message from the CEO 04

Executive board 06
How to read this report 07
Materiality 08

11

Strategic vision

25

People

Person 27

Communities 45

61

Planet

Introduction 63

Climate change
and energy 65

Water 79

Land use 85

103

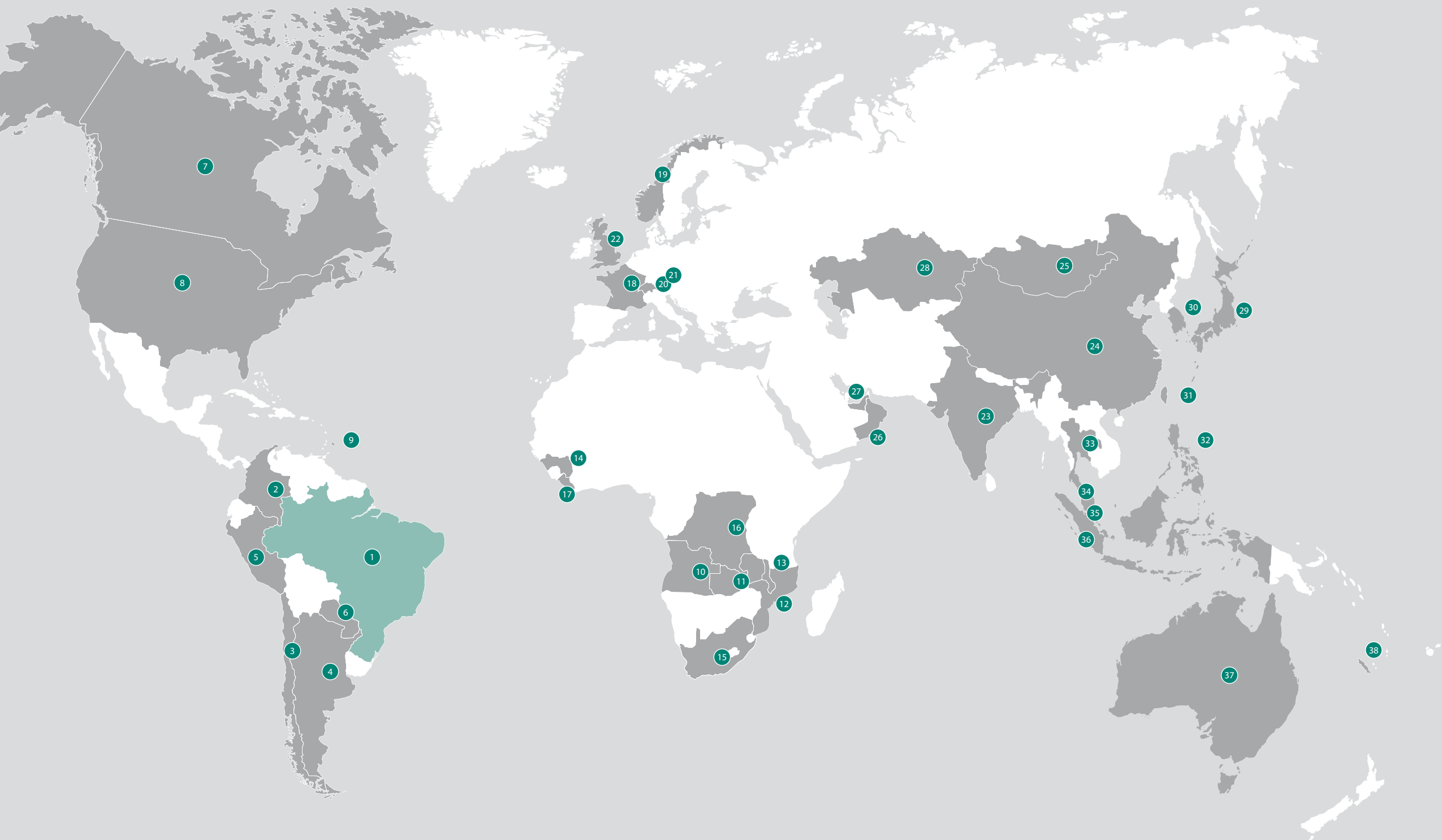
Creating value

Supply chain 105

Value added 113

In this report, the reader will find information about Vale's commitments, positionings, results and plans for material topics. The company invites all readers to use its communications channels to participate in the implementation of Vale's new Mission, Vision and Values. For Vale this is a major challenge, as well as being important for conserving the planet and for realizing the potential of people

Profile and global action



Vale is a publicly listed company that is headquartered in Rio de Janeiro and has a global presence. Its shares are traded in the securities markets of São Paulo, New York, Hong Kong, Paris and Madrid.

The company is the world's largest producer of iron ore and pellets and the second largest producer of nickel. Vale also produces copper,

metallurgical and thermal coal, manganese, ferroalloys, fertilizers, cobalt and platinum group metals. It also has activities in the logistics, steelmaking and energy sectors.

Vale's products are used, for example, in the steelmaking industry, in manufacturing airplanes and cars, in construction materials and in agricultural production.

Its products are present in the daily lives of people and help to improve their quality of life.

In 2011, the company's Mission, Vision and Values were updated to ensure that they focus on the sustainable development of its businesses.

GRI Reference

Profile: 2.1, 2.2, 2.3
2.4, 2.5, 2.6, 2.7, 2.8

	Operations
	Offices
	Joint ventures
	Exploration/Project/under development

Americas

1 Brazil	Vale's worldwide headquarters			
2 Colombia				
3 Chile				
4 Argentina				
5 Peru				
6 Paraguay				
7 Canada				
8 United States				
9 Barbados				

Africa

10 Angola				
11 Zambia				
12 Mozambique				
13 Malawi				
14 Guinea				
15 South Africa				
16 Democratic Republic of Congo				
17 Liberia				

Europe

18 France				
19 Norway				
20 Switzerland				
21 Austria				
22 United Kingdom				

Asia and Oceania

23 India				
24 China				
25 Mongolia				
26 Oman				
27 United Arab Emirates				
28 Kazakhstan				
29 Japan				
30 South Korea				
31 Taiwan				
32 Philippines				
33 Thailand				
34 Malaysia				
35 Singapore				
36 Indonesia				
37 Australia				
38 New Caledonia				

Position as of April 2012

Message from the Board of Directors

Vale is working to create prosperity, with social responsibility and respect for the environment



Ricardo Flores,
Chairman of the Board
of Directors

fatal accidents by 150%, to around US\$250 million in 2011.

For the sixth consecutive year, Vale obtained certification for its internal controls provided for by the Sarbanes-Oxley Act, in accordance with requirements for public companies with American Depositary Receipts (ADRs) listed on the New York Stock Exchange. Furthermore, for the second year in a row, it was selected as a member of the São Paulo Stock Exchange (BM&FBovespa)'s Corporate Sustainability Index (known by Portuguese acronym ISE).

Over the course of this report, which demonstrates alignment with the Principles for Responsible Investment (PRI), Vale reveals not only the results of its sustainability indicators in 2011, but also the challenges, positionings and commitments assumed by the company in the light of topics of relevance to it and its stakeholders.

As members of Vale's Board of Directors and on behalf of its shareholders, I reiterate my satisfaction with this process' evolution. I would like to thank the Executive Board and all of Vale's employees and partners for the results achieved in 2011. I am fully convinced that the company's path and the path of sustainable development will grow ever stronger if planned jointly. I hope you enjoy reading the report.

Vale's commitment to sustainable development, strengthened by its new mission and vision, guides its activities and investments.

Aware of the importance of its legacy, the company has been working to generate prosperity with social responsibility and respect for the environment. Commitments made to its stakeholders direct the company's action to establish best practices,

whether in terms of environmental management, facing the challenges of climate change, or valuing people and communities.

In 2011, Vale achieved record output of iron ore, pellets and coal, while its nickel and copper production levels were the highest since 2008. The company's investments, excluding acquisitions, amounted to US\$18 billion, 42% up on 2010. These indicators demonstrate the company's enormous potential in terms of generating value for its stakeholders.

Vale's social and environmental spending in 2011 came to US\$1.5 billion, 36% up on 2010. The company also increased its investment in projects to implement Critical Activities Requirements and thereby eliminate

GRI Reference

Profile: 1.1

Message from the CEO

Our goal is to develop our businesses on solid foundations, based on respectful relations with people and the planet, and sharing value with society

At the start of this 2011 Sustainability Report, I would like to address myself to all readers who are interested in understanding how Vale is preparing for a new economy, to leave a better world for future generations.

When I took over as Chief Executive Officer of Vale, I made a commitment to this challenge, in line with my closely held values: concern for life and the planet.

// I do not want there to be any doubt that, at this company, life is more important than production. If we have to choose, we must choose life



Looking to the future, we revised our Mission, Vision and Values, embarking on a new journey that will reach its destination when everything expressed there is reflected in all our behavior, with the aim of everyone working together continuously for a Vale that is ever more robust and aware of the new world in which it operates. In recent years, we have grown a lot. We are now present in 38 locations, whose cultures will guide our way.

The path I intend to follow together with everyone who has a relationship with Vale is challenging by definition, but imbued with respect and confidence in our capacity to promote sustainable development, prioritizing the value of life and human rights.

I see that we now have the challenge and opportunity to change health and safety-related statistics in mining. We will insist on our target of zero harm, as it is the only acceptable target. It is now our number one priority. We cannot say we are a truly successful company if we do not demonstrate the same excellence in our health and safety results that we have already demonstrated in our business results. I do not want there to be any doubt that, at this company, life is more important than production. If we have to choose, we must choose life.

Vale strives to deliver its products and services with quality and efficiency. Without a shadow of a doubt, we can be proud of our business results in 2011. For example, our operating revenue was 30% up on the previous year. We are also advancing in the implementation of a structured sustainability agenda. In 2011, our Action Plan on Sustainability reached all company operations, establishing targets for fundamental indicators such as water and energy consumption.

“ We are now present
in 38 locations,
whose cultures
will guide our way ”



Murilo Ferreira,
Chief Executive Officer

Also in 2011, we joined the select group of companies in the United Nations' Global Compact LEAD platform, an initiative that aims to spread sustainable practices initiated by leading companies. Through our involvement, we seek to mobilize the value chain to adopt measures based on complete respect for human rights, rigorous combating of poverty, and transparent management, among other things. Vale encourages its partners to engage with the Global Compact and to respect its principles, as we understand our role in the sustainable development of our value chain.

When conducting our activities, we know that we affect and transform the regions where we operate, both positively and negatively. Over the course of this report, I made a point that we should be very clear about these impacts, as well as the challenges that Vale faces. For us to grow on solid foundations, we know that our relations need to be underpinned by dialogue. This is essential to the process of strengthening society's trust in us and our license to operate.

Accordingly, this document sets out our positions and commitments on subjects of global interest, such as combating climate change, diversifying our energy matrix and preserving biodiversity.

Our goal is to develop our businesses on solid foundations, based on respectful relations with people and the planet, and sharing value with society. I hope you all enjoy reading this report, and I reiterate our interest in promoting constructive discussion about the topics covered in it.

GRI Reference

Profile: 1.1

Executive Officers



Murilo Ferreira
President and
Chief Executive Officer



Galib Chaim
Executive Officer
of Capital Projects
Implementation



Humberto Freitas
Executive Officer
of Logistics and
Mineral Exploration



José Carlos Martins
Executive Officer of
Ferrous and Strategy



Peter Poppinga
Executive Officer
of Base Metals and
Information Technology



Roger Downey
Executive Officer
of Fertilizers and Coal



Tito Martins
Executive Officer
of Finance and
Investors Relations



Vania Somavilla
Executive Officer
of Human Resources,
Health and Safety,
Sustainability and Energy

GRI Reference

Profile: 1.2, 3.1, 3.2, 3.3
3.4, 3.5, 3.13, 4.16, 4.17

Changes in Vale's Executive Officers – 2011/2012		Exit
Eduardo Bartolomeo	Executive Officer of Fertilizers and Coal	May/2012
Eduardo Ledsham	Executive Officer of Exploration, Energy and Projects	Nov./11
Guilherme Cavalcanti	Executive Officer of Finance and Investors Relations	Nov./11
Mário Barbosa	Executive Officer of Fertilizers	Nov./11


How to read this report

This report is based on the materiality matrix of Vale and is structured according to the company's Vision and the guidelines of the GRI

For the fifth consecutive year, Vale is publishing its sustainability report according to the guidelines of the Global Reporting Initiative (GRI), G3 version, including the Mining and Metals Sector Supplement. This edition refers to 2011 and, when applicable, covers developments over the period from 2009 to 2011.

The report also follows the guidelines of the International Council on Mining and Metals (ICMM) and the United Nations Global Compact, two international initiatives to which Vale is a signatory. The report serves as Vale's Communication on Progress (COP) for the Global Compact. The correlation index (which can be found online) allows readers to find information on how the company meets these commitments.

The 2011 report has achieved GRI application level A+, which covers all GRI profile items, management approach information, essential performance indicators and indicators from the Mining and Metals Sector Supplement, in accordance with the GRI's approach to the materiality principle.

This version is designed to illustrate the company's positioning and its results with regard to the demands of its main stakeholders, as highlighted in the topics defined by the Materiality Matrix. In the online version, complementary content can be found, indicated throughout the report by the symbol. 



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

The organization of this report by chapter enables readers to assess Vale's positioning and results in the company Vision's three main areas: People, Planet and Creating value. Before these three sections, there is a chapter explaining the company's strategic vision, based on its new Mission, Vision and Values and its Sustainable Development Policy.

The methodology used to define boundaries was the same as that used in sustainability reports of previous years (available in the online content).

Information on companies acquired in recent years, such as assets in the fertilizer area, and new projects that have started operating, has been integrated into the reported performance¹ indicators, in line with the incremental approach adopted.

External assurance


The information in the 2011 *Sustainability Report* was verified by the independent audit firm KPMG, as shown in the declaration available in the online version of this report. The assurance scope included compliance with the GRI methodology, assurance of information on profile items, management approach and performance, and the application level statement. In addition, KPMG checked Vale's adherence to the ICMM principles, as indicated in the declaration available in the online version of this report.

In total, Vale has reported 88 indicators, of which 49 are core, 28 additional and 11 are from the Mining and Metals Sector Supplement. Some of these indicators were included in the print version.

Complementary content is available in the online version on the Vale website.

In terms of management approach, Vale is globalizing its procedures and documents in order to reconcile local culture and the dynamics of each business, which demands time and capacity building from the teams involved.

Materiality

In 2011/2012 Vale undertook a robust process of validating its Materiality Matrix. This consisted of identifying those aspects of sustainability where the company has the most significant economic, social and environmental impacts, and those with the greatest influence on the decisions of its stakeholders in various countries. These were considered to be material topics. 

With the support of the Brazilian Foundation for Sustainable Development (FBDS, in Portuguese), Vale mapped those issues which are of the greatest relevance to the company's senior management and external stakeholders, who were represented by specialists in key topics: climate change, forests, communities, human resources, education and others.

Assessment and contact

For more information about sustainability, visit the company website www.vale.com and contact us through the Talk to Us channel, selecting the Sustainability category.

¹ Any differences in the sums of data and percentages in charts and tables are due to rounding, to facilitate the presentation of the information.

Materiality

A group of experts contributed the views of stakeholders about material topics for Vale

.....

"Vale has a track record in climate change and energy because of its participation in the *Letter on Climate Change*. But it needs to internalize the issue as an element of competitiveness and assume a public commitment and targets for reducing its GHG emissions."



"Vale needs to assume its role as a major player and be committed to supporting best practices to ensure that Belo Monte is a sustainable project. What today is a cost can become, with excellent management, a positive return."

.....

Sérgio Besserman

Economist and ecologist.
Professor of the Economics
Department of PUC-RJ

.....

"The educational problems at Vale go beyond basic education. I am sure that the company faces complex educational problems, as it is a very modern company which requires a qualified workforce."

.....

"There is no way that Vale can resolve the issue of education by itself. The company needs to look for better ways of interacting with public authorities in the educational sector. If Vale wants to be a lever for sustainable development, it has to continue to be a lever for education wherever it operates."

.....

Rosiska Darcy de Oliveira

Writer and journalist. Chairwoman of the Rio Como Vamos movement



"Water will soon come to be seen as a limited resource, and this will be exacerbated by climate change. This is an issue that has to remain a priority for Vale."

.....

"Vale needs to work on the idea of building together. It has to establish formal mechanisms for an intra-company dialogue and for a dialogue between the company and its many stakeholders."

.....

Tasso Azevedo

Forestry engineer.
Sustainability consultant



.....

"Vale can have an impact on the energy supply system in Brazil, establishing partnerships to promote a greater role for renewables."

.....

"If climate change is the hot topic of today, tomorrow it will be biodiversity. This means that Vale has to position itself for this issue, define a strategy and strive to leave a positive net impact."

.....

Marina Grossi

Economist. Chairwoman of the Brazilian Business Council for Sustainable Development (CEBDS)

.....

“The educational deficit is an issue that goes beyond Vale. It is not enough for employees to have access to education, if there is not this possibility in their communities. Education is also an issue for communities.”

.....

“Vale needs to create close links and enhance its relations with these communities.”

.....

Celso Castilho

consultant to Vale who worked at the company for 28 years



.....

“The energy topic is closely linked to climate change. Vale needs to define its choices: how will it position itself in relation to cleaner energies? What is it doing to make energy use more efficient?”

.....

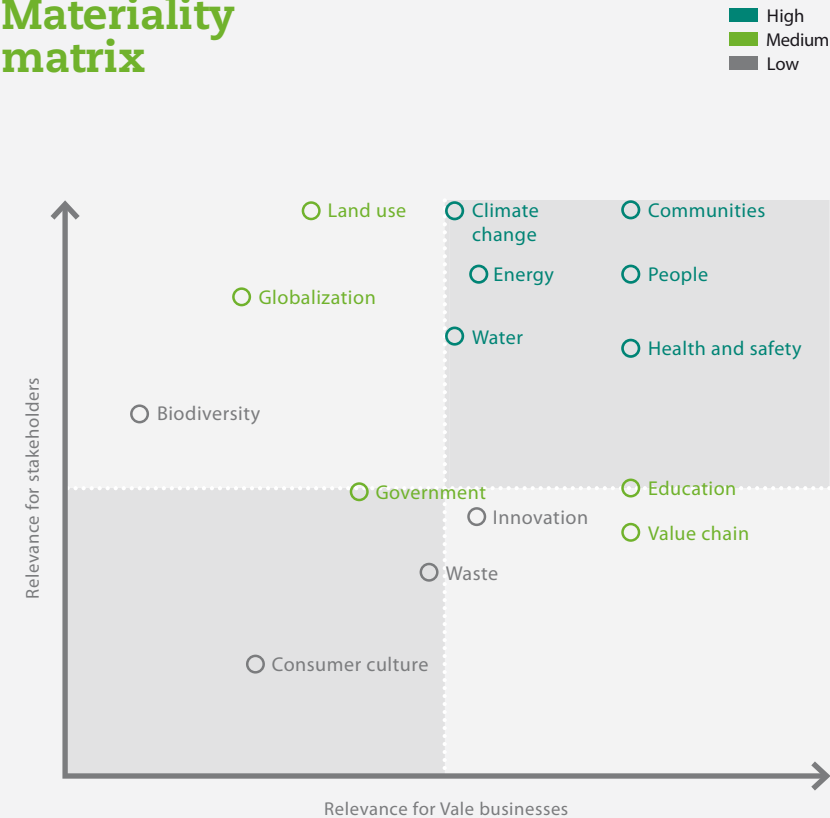
“It is essential for Vale to have a social license to operate. To achieve this, the company needs to have a long term commitment to the development of local communities, guaranteeing investment in education and encouraging sustainable productive activities.”

.....

Beto Veríssimo

Agronomist. Senior Researcher of the Amazon Institute of People and the Environment (Imazon)

Materiality matrix



The matrix above indicates the level of relevance of the key topics for Vale and its stakeholders.



US\$ **1.5 bn**

total social and
environmental
spending by Vale
in 2011

Strategic vision

Growing and sharing value, respecting the planet's limits

10%

is the proportion represented by health and safety performance in the variable remuneration of Vale's operational areas

In this chapter

Governance

Action Plan on Sustainability (PAS)

Research and innovation

Integrated risk management

Legal compliance

Ethics

Combating corruption

Human rights

Institutional partnerships

Public policies

José Assis de Souza,
Equipment Installation
Operator, who has been
at Vale for 22 years



Sustainable development

for Vale, means capturing
countless opportunities
for growth while recognizing
the planet's physical limits



94%

of the targets of the
Action Plan on Sustainability
(PAS) **were achieved or
beaten in 2011**

10

the number of principles
of the **United Nations
Global Compact** and of
the **ICMM**, initiatives to
which Vale is a signatory



55

the number of
**sustainability projects
underway** based on
cooperation between the
Vale Technology Institute
with universities and
research institutes

Sustainable development

In 2011, Vale underwent a series of organizational and senior management changes. The company also decided to review its strategic orientation and define a new position, reflected in its Mission, Vision and Values, which aim to align Vale with the sustainable development agenda. This process was concluded in 2011 and the new Mission, Vision and Values statement is now taking effect across the company. This will represent a significant challenge for Vale in the coming years.

Vale is a transformational company. It transforms the environment where it operates, the social context where it is present, and the economies where it carries out its activities. What does sustainable development mean for Vale? It means identifying the countless opportunities for growth that are available, while also recognizing the planet's physical limits. The immediate consequence of this understanding is that Vale works in the knowledge that natural resources are finite. The company is committed to practicing and promoting the efficient use of these resources, investing in clean energy and acting to mitigate the impact of its operations on climate change. For Vale, sustainable development also means sharing its opportunities and benefits with society, in particular with the communities, governments and local institutions that are directly and indirectly impacted by the company's activities.



Entrance of Vale's headquarters, the Barão de Mauá building in Rio de Janeiro, Brazil

To achieve this, it is essential for Vale to measure and report the positive and negative impacts of all its activities, in order to recognize them properly. Only on this basis will it be possible for the company to generate a positive legacy for its stakeholders.

In this report, based on a methodology that defines material issues, Vale assumes a range of commitments to its stakeholders, including the following:

People – To develop people, guaranteeing education and health and safety, building high-quality relationships based on trust;

Communities – To promote development with education and health and safety, leaving a positive legacy in the regions where Vale operates;

Value Chain – To promote the sustainability agenda with its suppliers and clients, striving to guarantee that human rights are not violated within the supply chain and to



Target

To reinforce relations with our stakeholders that are built on trust, using mechanisms for engaging with them

Communications with Stakeholders

Target audience	Communication Tools
General public	<ul style="list-style-type: none"> – <i>Vale's Sustainability Report</i> – Reporting Channel (described at www.vale.com) – Talk to Us (available at www.vale.com) – Vale website (www.vale.com) – Reputation, image and opinion surveys¹ – Communication campaigns
Shareholders, debenture holders and investors	<ul style="list-style-type: none"> – Form 20-F reports, press releases, fact sheets, announcements and minutes of General Shareholders' Meetings, quarterly financial reports and reference forms – Visits to Vale's operations – Meetings with investors – Email: rio@vale.com – Contact telephone of Investor Relations Department: 55-21-3814-4540
Customers	<ul style="list-style-type: none"> – Campaigns – Special events – Visits and meetings at Vale – Satisfaction surveys
Employees	<ul style="list-style-type: none"> – Internal publications – Vale Portal (intranet), Vale Global portal – Employee survey and reputation, image and opinion survey¹ – Special events, internal campaigns and direct communications
Suppliers	<ul style="list-style-type: none"> – Visits and meetings at Vale – Exchange programs – Structured meetings
Communities	<ul style="list-style-type: none"> – Socioeconomic diagnoses – Meetings for prior consultation – Interviews – Focus groups and visits to units – Meetings with Leaders program – External disclosure — <i>News</i>
Governments and civil society	<ul style="list-style-type: none"> – Participation in associations and entities – Meetings for prior consultation – Interviews

¹ The Vox Populi image survey is now conducted annually. The reputation survey was established in 2008 and subsequently took place in June 2011.

support the development of suppliers in regions where the company operates;

Government – To act on promoting sustainable development in partnership with governments, based on the company's participation in public policy and at the created and distributed economic value.

Engagement

In order to act on these commitments and to reinforce the company's license to operate and grow, Vale needs a new way of engaging its stakeholders and to develop effective mechanisms for listening to them and responding to their demands, handling sensitive issues with respect. By treating its stakeholders as equal partners in its relations with them, Vale aspires to build relationships of trust and confidence, improving its capacity to listen and using a range of mechanisms and channels for communicating with stakeholders, such as opinion surveys, meetings with communities, and participating in committees that address social and environmental issues.

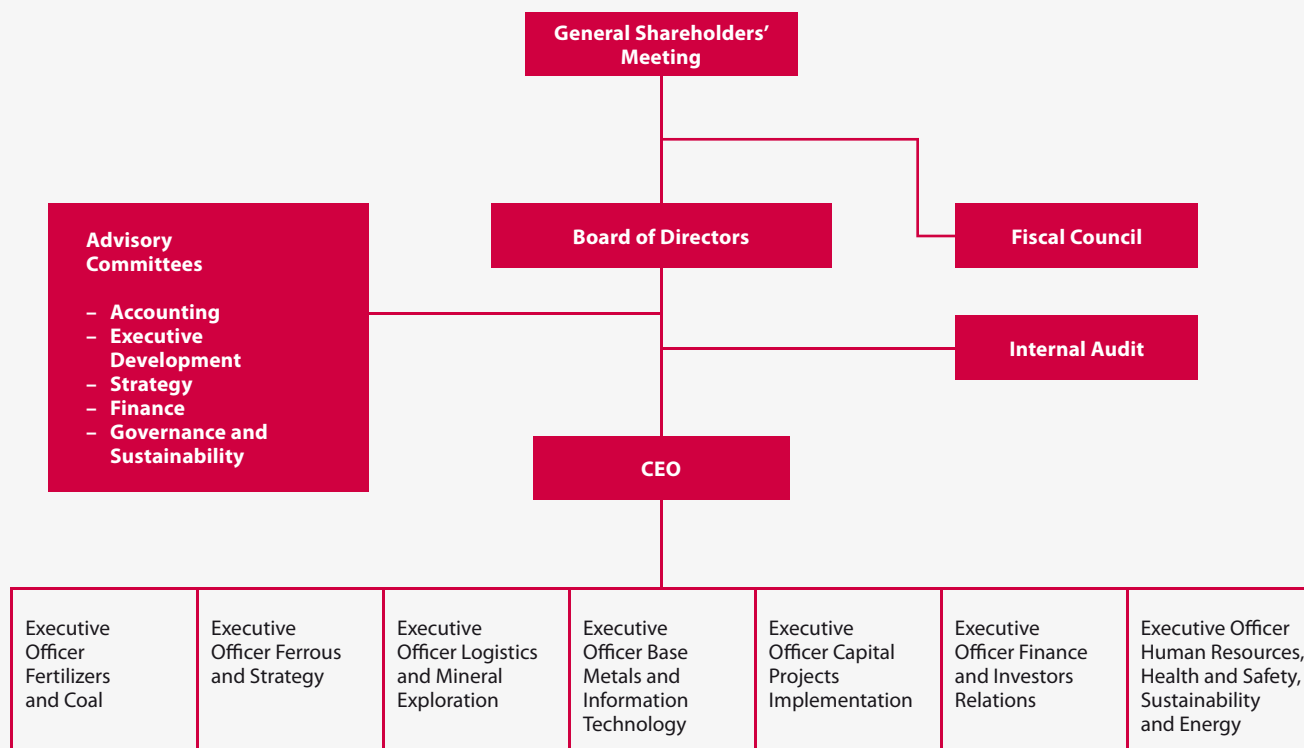
Vale aims to guarantee that its governance structure incorporates the perspectives of its stakeholders, by establishing processes for listening to them and receiving their feedback in a way that enables them to make their opinions known.

The company's senior management is committed to this new strategic vision, which prioritizes people and the planet. By constructing a dialogue with society, Vale aims to be able to understand and respond to the aspirations of its stakeholders.

The company's strategic vision of sustainability is based on a series of commitments to the planet and to people, and on open relationships with its stakeholders.


Vale is committed to acting on this vision in every part of the world where it is present and in very diverse cultures. This is perhaps one of the company's greatest challenges. It is a challenge that senior management is very focused on meeting, leveraging a system of governance that is aligned with global best practice.

Governance Structure



Governance

To enable the implementation of the company's strategic vision, Vale relies on a governance structure that provides support to the company's senior management, defends the company's values and follows international benchmarks for corporate administration. Vale's Board of Directors has an Advisory Committee that is dedicated to Governance and Sustainability issues. The Executive Officer for Human Resources, Health and Safety, Sustainability and Energy is responsible for sustainability issues and is supported by dedicated corporate bodies.

The organizational changes implemented in 2011 were designed to enhance the management of key issues for the organization, such as health and safety, with the creation of a Global Department for Occupational Health and Safety. Regarding community relations, a Community Relations Department was established in order to enhance relations with the people who live in regions where the company operates. 

To enable the company's governance to follow international management standards for sustainability, Vale has implemented a series of global policies. The sustainable Development Policy¹, which was created in 2009, provides orientation for Vale in three areas: being a Sustainable Operator, a Local Sustainable Development Catalyst and a Global Sustainability Agent.

This Policy complements the company's Climate Change Policy, created in 2008. Since then, Vale has established other global policies that are directly related to sustainability, such as the Human Rights Policy, the Accountabilities Norm for Health, Safety and Environment and the Health and Safety Policy, among others.

One of the major challenges that Vale faces today is to implement its main policies at the same rate of growth as the company, while also respecting local cultures. These policies have resulted in management systems that are monitored using

¹ The complete text of the Sustainable Development Policy is available at www.vale.com, in the Sustainability section.

GRI Reference

Profile: 4.1, 4.4, 4.14, 4.16



Challenge

To implement the main policies at the same pace at which the company is growing, while **respecting local characteristics**

indicators to assess business performance and to determine employees' variable remuneration.

In 2011, the company's performance in Health and Safety represented 10% of the variable remuneration of Vale employees in operational areas and 5% in corporate areas, to support a health and safety-conscious culture. In addition, the goals of the Action Plan on Sustainability (PAS, in Portuguese), described in the table, are also directly linked to variable remuneration payments, and represented 5% of the variable remuneration of all employees in 2011. This underlines the company's commitment improving its sustainability management and results.

Action Plan on Sustainability (PAS)

Vale is working closely with its global operations to implement and execute the company's Strategic Vision, one of Vale's greatest challenges. The Action Plan on Sustainability (PAS) is one mechanism to help ensure that this Vision is realized in Vale's operational practices, resulting in tangible benefits.

Initially focused on standardizing Vale's sustainability indicators and improving the company's performance, in 2011 PAS was extended to cover global coal, nickel,

kaolin and fertilizers, in addition to the iron ore, pelletizing, logistics, manganese, copper and potash units included in 2010, covering every area of the company.

The selected sustainability indicators are related to the following aspects: energy supplies, water, waste, mine closure, local development and human resources. Targets were established for all of these aspects. These targets make a direct or non-direct contribution to improving Vale's performance in these issues. For example, the energy targets (EN3 and EN4) have contributed to reducing greenhouse gas emissions. More information is available in the Planet chapter, in the Climate Change and Energy section.

The table on pages 18 and 19 presents the results for variable remuneration in 2011 and the targets set for variable remuneration in 2012. In the classification used by Vale, "Target Achieved" corresponds to level 3 of the target and "Challenge Achieved" means the overcoming of level 3.

Most of the 2011 results, a total of 25, were "Challenges achieved", while seven were "Targets achieved" and just two were "Targets not achieved." The reasons for not achieving these targets were as follows:

EN3 – target for reducing fuel consumption: in the copper operation in Brazil the increased depth of the mine resulted in increased average transport distances and hence higher consumption of diesel. As a result, the target was not achieved. The target for 2012 takes this issue into account.

EN22 – reduction of specific generation of oily hazardous wastes: in the copper area in Brazil, there was an increase in sand and soil contamination by oil and grease. This was due to soil being transported to the equipment washing yard of the operations, and maintenance work carried out on equipment in unpaved areas. The business area has implemented measures to mitigate its generation of this waste and has also planned to re-use the waste and to classify it as a by-product.



Sustainability is now one of the pillars of Vale's strategy. We know that there can only be sustainable development when companies and society work together. For us, sharing value is as important as creating value

Vania Somavilla, Executive Officer of Human Resources, Health and Safety, Sustainability and Energy

Research and innovation

Vale's strategy for technology and innovation is based on the actions of the Vale Technology Institute (ITV), one of whose main objectives is to contribute to the development of the technology economy in Brazil, by investing in scientific research and disseminating innovation and knowledge that can contribute to socio-economic and environmental development and support the sustainable mining sector.

The ITV is putting into practice one of Vale's core values, establishing partnerships and working together with a common goal: sustainable development.

Based on this philosophy of cooperation, in 2011 the ITV organized a series of seminars with the Brazilian and global science and technology community which discussed mining in the future and the technological outlook for the sector. Researchers and academics from Brazil and other countries participated in these seminars. Participants discussed a range of issues, including climate change and natural phenomena, energy production and use, integrated planning and management of natural resources, and sustainable practices in the production chain.

The ITV is also working in partnership with universities and research institutions. There are currently 55 projects underway that are related to the environment, health and safety and other aspects of sustainability. These projects are in the development stage and Vale believes that they have the potential to contribute to improving the company's social, environmental and economic performance. Examples of some of these initiatives are discussed on pages 34, 56 and 88.

More than US\$100 million was invested in 270 actions to improve performance in sustainability

All PAS indicators have improvement action plans, whether the targets and challenges were achieved or not in 2011. These plans are based on technical visits, assessments and meetings with those responsible for the themes (water, waste, training, local purchasing and others) at operational and corporate areas.

Vale invested over US\$ 100 million in 2011 in 270 actions to improve its performance in sustainability, especially in the areas of hazardous waste, water resources, and direct and indirect energy. Each operational department manages these investments. In the same year, these indicators began to be monitored in the monthly performance management meetings of each Vale department.

In 2012, in addition to the indicators of 2011, PAS will include an indicator on the Recovery of Degraded Areas, with performance indicators that will be monitored over the course of the year.²

GRI Reference

See table on the next page

Indicators: EN5, EN7

² The indicator for the recovery of degraded areas forms part of the variable remuneration for the ferrous area in 2012.

Targets of the 2011 PAS

Business Unit	Metric (specific consumption)	2011 Challenge (average variation from 2010)	Average result in 2011	2012 Challenge (target value or average variation from 2011)
EN3 Objective: reduce specific consumption of fuel				
Iron Ore and pellets	liters/metric ton ton transported	Reduction of 1.8%.	●	No target in 2012. ^{IV}
Potash	m ³ /metric ton produced	Reduction of 1.7%.	●	Maintain the 2011 result (10 m ³ /metric ton produced).
Copper (Brazil)	liters/metric ton produced	Reduction of 1.8%.	✕	Proposed average consumption of 0.72 liters/metric ton moved.
Fertilizers	m ³ /metric ton produced ^{II}	First year of implementation of the PAS. ^{III}	●	Proposed reduction of 6% in seven operations representing 0.03% of the total indicator for Vale.
Coal (Australia)	liters/metric ton moved	First year of implementation of the PAS. ^{III}	▲	Proposed average consumption of 0.83 liters of diesel/metric ton moved.
Nickel (Canada and Indonesia)	GJ/ton produced ^{II}	First year of implementation of the PAS. ^{III}	●	Execute the action plan and define quantitative targets.
EN4 Objective: reduce specific consumption of electricity				
Iron Ore and pellets	MWh/metric ton produced	Reduction of 3.5% for two of the Iron Ore operations. The operations account for 29% of the indicator for the business.	●	No target in 2012. ^{IV}
Manganese (Brazil)	MWh/metric ton produced	Reduction of 5.3%.	▲	No target in 2012. ^{IV}
Potash	MWh/metric ton of ore excavated	Reduction of 1.9% from electricity consumption in 2009.	●	Proposed average consumption of 78,000 kWh/metric ton excavated due to change to the current operation with a reduction in the volume of mineral extracted.
Copper (Brazil)	MWh/metric ton produced	Reduction of 5%.	●	Proposed average consumption, compared with 2011, of 30.24 kWh/metric ton produced.
Fertilizers	MWh/metric ton produced ^{II}	First year of implementation of the PAS. ^{III}	●	Proposed average reduction of 2% in eight operations (6.9% of the total indicator for Vale).
Coal (Australia)	MWh/metric ton moved	First year of implementation of the PAS. ^{III}	▲	Proposed average electricity consumption of 0.004 MWh/metric ton moved.
Nickel (Canada)	MWh/metric ton produced ^{II}	First year of implementation of the PAS. ^{III}	●	Execute the action plan and define quantitative targets.
EN8 Objective: reduce specific consumption of electricity				
Iron Ore and pellets	m ³ /metric ton produced	Reduction of 4.8% for one of the iron ore operations, accounting for 3% of the indicator for the business.	●	No target in 2012. ^{IV}
Logistics	m ³ /MGTK (railroad) m ³ /metric ton transported (ports and shipping)	Reduction of 7.5% for three of the logistics operations, accounting for 60% of the indicator for the business.	●	Proposed reduction of 1.1% in five operations (1% of the total indicator for Vale).
Manganese (Brazil)	m ³ /metric ton produced	— ^{IV}	●	Proposed reduction of 1% in three operations (0.1% of the total indicator for Vale).
Copper (Brazil)	m ³ /metric ton produced	Reduction of 2% from specific consumption in 2009.	●	Proposed average consumption, compared with 2011, of 16.53 m ³ /metric ton produced.
Fertilizers	m ³ /metric ton produced	First year of implementation of the PAS. ^{III}	●	Proposed reduction of 4.2% in five operations (19.5% of the total indicator for Vale).
Coal (Australia)	m ³ / metric ton moved	First year of implementation of the PAS. ^{III}	▲	Proposed average consumption of 0.079 m ³ /metric ton moved.
Nickel (Canada and Indonesia)	m ³ /metric ton produced ^{II}	First year of implementation of the PAS. ^{III}	●	Execute the action plan and define quantitative targets.

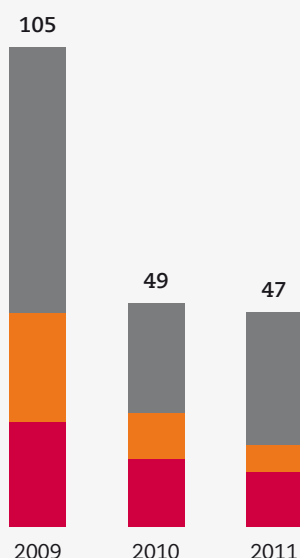
- ▲ Target reached
● Challenge achieved
✗ Target not reached

I The logistics operations already have an operational target for energy efficiency, so were not included in the PAS for the EN3 and EN4 indicators.
II Metrics may vary in accordance with the type of operation and the relevance of the indicator for each operation.

III In the first year of the PAS, the units have a target which consists of an action plan to start the improvement process.
IV In the areas for which targets are not shown in the table, targets have been suggested as a reference, or the target is to maintain the current performance, due to various operational factors

EN10 Objective: increase percentage of water reused/recycled				
Iron Ore and pellets	%	Increase of 5.3% for two of the iron ore operations, accounting for 13% of the indicator for the business.	●	Proposed increase of 1.8% in one operation (1.5% of the total indicator for Vale).
Logistics	—	— ^{IV}	—	Proposed increase of 64.8% in three operations (0.1% of the total indicator for Vale).
Manganese (Brazil)	%	Increase of 3.6% for one of the two manganese operations, accounting for 98% of the indicator for the business. ^{III}	●	No target in 2012. ^{IV}
Copper (Brazil)	%	— ^{IV}	▲	No target in 2012. ^{IV}
EN20 Reduce emissions of particulate matter and SOx and NOx				
Nickel (Canada and Indonesia)	%	First year of implementation of the PAS. ^{III}	●	Execute the action plan and define quantitative targets.
EN22 2010 Objective: reduce specific generation of oily hazardous waste / 2011 Objective: reduce the generation of all hazardous wastes.				
Iron Ore and pellets	t/Mt transported	Reduction of 7.9% in total hazardous waste for three of the iron ore operations, accounting for 43% of the indicator for the business.	▲	Proposed average reduction of 3.6% in two operations (7.6% of the total indicator for Vale).
Logistics	t/MGTK (railroad) t/metric ton transported (ports and shipping)	Reduction in total hazardous wastes of 13% for three of the logistics operations, accounting for 93% of the indicator for the business. ^{III}	▲	Proposed average reduction of 1% in four operations (4.1% of the total indicator for Vale).
Manganese (Brazil)	t/Mt transported	— ^{IV}	●	No target in 2012. ^{IV}
Potash	t/million metric ton excavated	— ^{IV}	●	Maintain the result of 2011 (1,000.07 ton/mn metric tons excavated).
Copper (Brazil)	t/Mt transported	Reduction of total hazardous waste by 5.9%.	✗	No target in 2012. ^{IV}
Nickel (Indonesia)	metric ton	First year of implementation of the PAS. ^{III}	●	Execute the action plan and define quantitative targets.
EN22 Objective: increase recycling, composting and re-refining of waste				
All business units in Brazil	% of waste sent for reuse/re-refining, reprocessing, recycling or composting	Reduction of 5.5% (73.2% of waste sent to the categories of recycling, composting and waste re-refining).	●	Maintain the 2011 result (73.2% of waste sent to the categories of recycling, composting and re-refining).
LA10 Objective: increase training hours				
All business units in Brazil	2010: % of supervisors trained 2011: % of hours trained to hours worked	Target rate of 2.4% hours of training per hours worked by employee.	●	This indicator is being restructured to improve the management of this issue.
EC6 Objective: increase percentage of local purchasing				
Shared Services Organization (SSO)	% of purchasing made in the state where the operation takes place	Reach target of 59.1% of local purchasing in monetary value in the Brazilian states of Pará, Maranhão, Espírito Santo and Minas Gerais.	●	Maintain the 2011 result (60.8% of local purchasing in the main states in Brazil, Pará, Maranhão, Espírito Santo and Minas Gerais).
MM10 Objective: increase the percentage of operations with a mine closure plan				
All business units in Brazil with mining activities	—	All units to conclude the Conceptual Plan based on the Terms of Reference for Mine Closure Plans by the end of 2013.	●	Iron business units will continue to work to implement this plan ahead of the deadline for the Terms of Reference. Other business units are in the process of finalizing the plans.

Incidents of corruption



	2009	2010	2011
Cases involving other measures ^I	58	24	29
Cases of non-renewed contracts	24	10	6
Cases with dismissal or punishment ^{II}	23	15	12
Total	105	49	47

^I Cases of corruption were presented to company administrators and those responsible for the affected areas, resulting in 120 actions to mitigate fraud risks, warnings, deductions and fines imposed with the support of the Legal Department.

^{II} The number of employees dismissed/punished in corruption cases was 83 in 2009, 23 in 2010 and 20 in 2011. In 2011, the main causes for dismissal related to corruption were conflict of interest/ influence peddling (45%), fraud (25%) and the inappropriate use of corporate resources (10%).


Ethics

Vale's Strategic Vision represents many challenges for the company. To implement this vision successfully, it is essential for the company to act correctly and in accordance with its values. Vale has a number of instruments at its disposal to ensure ethical standards in its activities, such as the Code of Ethical Conduct, which is also available in versions for suppliers and the financial markets (available at www.vale.com), Sarbanes-Oxley Certification (SOX Certification, since 2006), and a Reporting Channel for complaints and information. This channel enables people to report complaints about possible irregularities or improprieties in accounting, auditing and internal controls, as well as irregularities in the areas of ethics, human rights and the environment. For more information about how the company manages cases of discrimination, please read the People chapter.

Integrated risk management

Vale believes that risk management, aligned with its commitment to sustainable development, is essential for the company to implement its growth plan, strategic planning maintain financial flexibility and achieve a consolidated vision of the risks to which it is exposed. 

Legal compliance

In 2011, Vale recorded the existence of 293 significant legal proceedings — 136 judicial and 157 administrative³. During this period, no fines were paid, nor were any non-monetary sanctions imposed⁴. The judicial proceedings include 69 proceedings related to civil actions concerned with the legality of the privatization of Vale and 52 tax cases in which Vale is contesting undue demands for Financial Compensation for Mineral Exploration (CFEM). These cases also represent the majority of the administrative proceedings (145). 

Combating corruption

Acting in the right way means that corruption is intolerable. Vale follows the best practices in the market to prevent losses and investigate cases that are possibly associated with fraud, deviations, and illicit acts. Cases that have been identified and duly substantiated with facts and figures are treated seriously and in proportion to the damages incurred or avoided. People who have been proved to be involved in these situations are held accountable and are disciplined with dismissal and legal proceedings. Contracts with companies involved in proven illicit acts will be terminated. Companies will be removed from the Vale registry and are subject to penalties that are proportionate to the damages caused.

In 2011, the company identified 47 incidents of fraud, as shown in the chart above. Vale continues to focus on assessing risks of corruption and preventing losses especially in the supply chain, in contracts with operational areas and in tenders for suppliers, while it also acts to

³ Legal proceedings are considered significant based on the following criteria: a) their value, including compensation claims and fines; b) whether they involve a subject of interest to the company or affecting the general public, regardless of value; c) those resulting from non-monetary sanctions.

⁴ In this report, Vale continues to disclose existing cases to which the significance criterion applies. However, the company now discloses only those values acknowledged as owed or already paid by Vale, to best meet the scope of the SO8 GRI indicator and to avoid any distortion of reality concerning judicial and administrative proceedings that, as they are awaiting the final decision, cannot normally be accounted for precisely. Vale's Form 20-F report contains an estimated provision according to accounting criteria.




Research: employees work in the laboratory of the Mineral Development Center (CDM) in Santa Luzia, Minas Gerais (Brazil)

Activities to assess risks of corruption are based on the internal regulations of the Corporate Security Policy

prevent losses in capital projects and sustaining investments. In partnership with other departments, Vale carries out intelligence work using data from the Shared Services Organization (SSO) to identify opportunities for preventing losses in the operational areas and investigate any issues that have been detected in the work of the company's Internal Audit services.

Registered cases refer to measures taken specifically with regard to fraud against the company. None of the registered cases referred to possible irregularities or improprieties in the company's accounting records or internal

controls. Furthermore, no situation of corruption (active or passive) of public officials or government representatives involving employees was recorded during this period.

Vale acts to prevent corruption in a number of ways, including regular classroom training courses to combat fraud, such as the Online Course in Business Ethics. In 2011, 1% of Vale's employees received classroom or online training. The company's main challenge is to extend access to this knowledge to its employees as rapidly as possible. Vale is committed to focusing its efforts on engaging its teams in this area. 

Human rights


Vale has established a series of guidelines and principles that inform its projects and operations on how to act in terms of respect of human rights throughout the entire life cycle of its activities, as well as in the production chain in the regions where it is present. Vale has also assumed the significant challenge of raising human rights awareness, in partnership with its

GRI Reference

Indicators: SO2, SO3, SO4 and SO8


stakeholders, its employees (where the company has a direct influence), as well as in the communities and countries where it operates and with its customers, partners, suppliers and other stakeholders.

In 2009, the Vale Human Rights Policy established principles and guidelines to be followed. Vale acts in accordance with local labor legislation, and is a signatory to the International Council on Mining and Metals (ICMM) and to the United Nations (UN) Global Compact, as well as other institutions that have adopted respect for human rights as a principle.

In addition to the Human Rights Policy, Vale also has a Human Rights Guide that establishes the company's positioning on human rights issues. In 2011, Vale revised the guide and published a second edition that aims to support not only its employees, but also other stakeholders, in understanding and respecting human rights. The guide addresses issues such as: respect for diversity; awareness of harassment; relations with employees, customers, partners, suppliers, communities, governments and society; child labor and forced labor; artisanal mining, and others. The content of the human rights guide is available at www.vale.com, in the Sustainability/Human Rights section. 

Institutional partnerships

Vale knows that it faces challenges. The company has established a range of partnerships that help it exchange experiences and discuss global best practice. These partnerships include its memberships of the ICMM, the United Nations Global Compact, the World Business Council for Sustainable Development (WBCSD), Business for Social Responsibility (BSR) and other organizations.

Vale participates actively in national and international entities and forums, such as the Earth Moving Equipment Safety Round Table (EMESRT), the Green Building Council (GBC), the Brazilian Mining Institute (Ibram), the Brazilian Business Council for Sustainable Development (CEBDS) and the Ethos Institute for Business and Social Responsibility, among others, so that it can contribute to global discussion on issues such as health and safety, the green economy, climate change and others. 



An employee in the control room of the operations in Goro, New Caledonia

In line with its Strategic Vision, Vale understands that it is not enough to respect human rights: it must also contribute to promoting them throughout the company's sphere of influence

GRI Reference

Indicators: SO5, SO6
Profile: 4.12



To promote sustainable development, we need to recognize that the natural resources of the planet are finite, make our operations more efficient and work constructively with our stakeholders

Giane Zimmer,
Sustainable Development Director

Public Policies

Vale maintains constant dialogue with government authorities in the countries where it operates. Considering that mining is a closely regulated sector, Vale strives to ensure that its points of view are understood and taken into account in public policy making processes.

The company seeks constructive dialogue in an attempt to reach a consensus with those engaged in sustainable development policy making and with the many stakeholders in the mining sector. The company bases its relations on transparency, trust and clear objectives.

In 2011, an internal workshop was held, lasting two days, covering political and institutional relations and aimed at employees of the Institutional Relations area. The workshop provided participants with an opportunity to understand the policy-making process and enhance their knowledge of how public authorities function, as well as looking for coherent and harmonious relations with members of state and federal governments and representatives of civil society.

Vale's relations with governmental authorities and civil society organizations are guided by its Code of Ethical Conduct and by its Vision, Mission and Values

As an example of its work in the public policy sphere, in 2011 Vale was invited by the Ministry of Mines and Energy in Brazil to participate in developing the Sector Plan for Mining for reducing greenhouse gas emissions, as part of the National Policy for Climate Change. The company supported the initiative with the Brazilian Institute of Mining and the Plan was delivered to the Environment Ministry in 2012.

Vale seeks to maintain strict impartiality with regard to political activities, and acts in compliance with the laws of each country where it operates. Employees, as individuals and citizens, are free to participate in such activities, provided that any public statements they make are clearly personal views rather than the company's position. Vale S.A. does not make donations to electoral campaigns, but other companies in the group are not prevented from doing so. Donations made by these companies can be found in the public records of the official institutions that are responsible for elections in the countries and regions where Vale operates.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

A woman with dark hair, wearing safety glasses and large white earplugs, is focused on her work. She is wearing a green short-sleeved shirt with a 'VALE' logo on the chest. A red safety strap is visible across her chest. She is holding a black control lever with both hands, which have red nail polish. The background is dark and industrial.

80

.....

the number of actions considered to be best practices in health and safety that were shared in the operational areas and projects in 2011

Monica Pilar Silva Souza, equipment operator, at Vale for 12 years

Putting people first, all the time

62%

was the percentage of the workforce hired locally in 2011

In this chapter

Person

Health and safety
Education
Human rights
Relationships built on trust
Respecting differences
Remuneration and professional evaluation
Turnover
Freedom of association and negotiation
Benefits
Pension plans

Communities

Potential impacts
Promoting development
Involuntary relocation
The Vale Foundation
Social spending
Local Hiring
Dialogue and ombudsman
Health and safety in the community
Preservation of cultural and ethnic identity



Commitment

To invest in people and build high-quality relationships based on trust, making the company one of the best places to work

To ensure continued growth and good results it is essential to invest in the **development of the people** who carry out the company's activities

US\$250_{mn}
the total
invested by Vale in
projects to improve
health and safety

187,700

the number of
employees and contractors
at Vale

Employees —
by gender**



12.3%



87.7%

** Corresponding to 98% of total employees reported (LA1)

People Person


Employees
in pier operations
at the Maritime
Terminal
of Tubarão,
Vitória (ES), Brazil



Vale's success depends above all on its people. Qualified human capital is essential if the company is to ensure the expansion of its operations and execute its growth strategy. Demand for professionals is expected to continue to grow significantly in the coming years, which represents a major challenge for Vale, whose activities often take place in regions that are a long way from urban centers and have a limited supply of qualified workers.

It is a principle of Vale to recognize the value of the people at the company, which means that it must build high-quality relationships with employees and contractors¹. The company understands that it needs to undertake a series of measures to achieve this aspiration, especially in the very culturally diverse areas where it operates. The company is investing in internal education, offers benefits aligned with best market practices, assesses its employees' satisfaction by using working climate surveys, and has an unwavering commitment to health and safety.

Profile of Vale's people

In 2011, Vale had 187,700 workers, including its own employees (with an open-ended employment contract) and contractors (service providers in permanent activities and projects). This represented an increase of 13,600 (7.8%) compared with 2010. The company also has 3,200 employees on fixed-length contracts (15% up on 2010). Around 78% of all employees work in Brazil. 

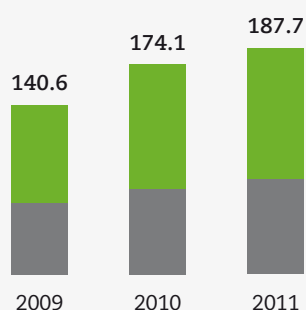
¹ Contractors generally work on retrofitting, expansion and new projects, as part of maintenance, cleaning, and property security contracts, among other services provided. As Vale is growing its activities worldwide, 28% of employees are contractors allocated to projects.

GRI Reference

Indicator: LA1

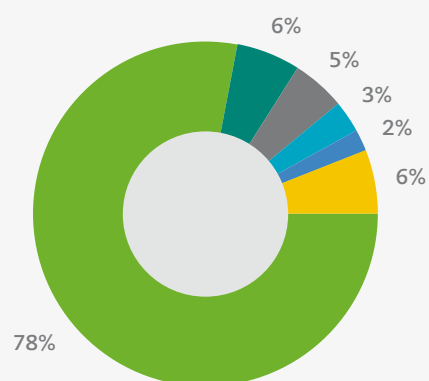
Workforce

In thousands



	2009	2010	2011
Contractors	80.6	103.3	108.1
Employees	60.0	70.8	79.6
Total	140.6	174.1	187.7

Distribution of employees and contractors Workforce by region (2011)¹



Countries	%
Brazil	78%
Canada	6%
Indonesia	5%
Mozambique	3%
New Caledonia	2%
Others	6%

¹ Employees and contractors shown in the chart account for 100% of reported employees (LA1). The regional distribution of employees changed from 2010 to 2011 mainly in the state of Pará, as a result of the sale of the aluminum business (Companhia de Alumina do Pará, Alunorte, Albras e Mineração Paragominas S.A.). In the global businesses, the start of operations at the Bayovar project in Peru led to an intake of employees.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

Health and safety

Life always comes first for Vale. The only acceptable target is zero harm. This means that every day all of its employees and contractors must be able to return home intact and healthy. Vale also believes that healthy and safe communities are essential for a healthy and safe company.

Vale's strategy for achieving zero harm is based on developing a health and safety culture and a culture of prevention that is founded on the engagement and commitment of the company's leadership and the continuous development of people. The company's main focus is on the permanent engagement of its leaders in achieving cultural change, the implementation of its global health and safety management system including measures to prevent fatality risks, and the implementation of its integrated health strategy (occupational health, health promotion and community health). Vale supports technological innovation in processes and procedures by using benchmarking and implementing best practices.



The issue of health and safety comes before any other activity or priority at the company. It is a permanent commitment for all of us

Galib Chaim, Executive Officer of Capital Projects Implementation

In 2011, Vale supported the promotion of a health and safety culture through actions such as Behavioral Dialogues, the Day of Reflection on Health and Safety, and events such as debates at the I Global Health and Safety Forum.

Vale also uses Fatality Risk Standards (internally referred to as Critical Activities Requirements or RACs) to help eliminate fatalities. These essential health and safety requirements mandate the adoption of standards, procedures, training and investment in infrastructure. There are 11 defined standards that historically represent 84.5% of fatalities².

² Critical activities are those that involve working at heights, electricity, automotive vehicles, mobile machinery, equipment lockout and tagout, cargo handling, confined spaces, machinery protection, slope stabilization, explosives and blasting, and chemical products.



We are investing a lot in health and safety and building a culture of prevention and risk management in our company. All fatalities, injuries and illnesses are preventable and our goal is zero harm

Jennifer Hooper, Global Director of Health and Safety

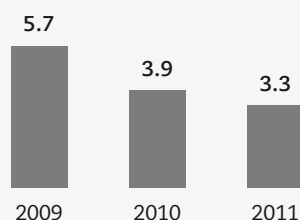
Investment of more than US\$250 million was made in 2011 to improve health and safety, 150% up on 2010's figure. RACs are being implemented in Vale's operations and projects. About 84% of the company's operations now apply the RACs.

In 2011, compliance with RACs increased by around 60% compared with 2008, the first year in which they were implemented. In 2008, the compliance rate was 52%.

In 2011, Vale carried out a global audit for the first time. The RACs and Legal Requirements were audited by Bureau Veritas and Accenture. In total, 130 operations and projects in Brazil and other countries and 13 critical suppliers were audited in 2011. 

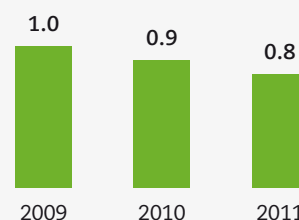
Injury rate^I

Number of total injuries per 1,000,000 hours worked^{II}



Injuries with lost time^I

Number of lost-time injuries per 1,000,000 hours worked



- ^I The data in the charts include employees and contractors.
- ^{II} Figures include injuries with and without lost time. The rate does not include occupational illness or first aid treatment. For Vale Brazil, health and safety indicators are based on monthly person-hours worked estimated for its workforce. The figures include mineral exploration companies, including international ones. For Vale Canada and its subsidiaries, Vale Australia and the Moatize Project, actual person-hours worked are used.

GRI Reference

Indicator: LA7

Unfortunately, despite all these efforts, there were 15 fatalities caused by the following 11 incidents:

- Train collision in Colombia (two employees);
- Cleaning vehicle fell into the sea from a pier in Brazil (one contractor);
- Malaria diagnosis, in Guinea (one contractor);
- Material falling from a height Brazil (one employee);
- Uncontrolled release of rock and ore in an underground mine passage in Canada (two employees);
- Car accident, in Brazil (two contractors);
- Person hit by train, in Brazil (one employee);
- Person hit by bus, in Brazil (one contractor);
- Compacting vehicle falling off the edge of a slope, in Mozambique (one contractor);
- Vehicle falling into an open hole in an underground mine, in Canada (one employee);
- Collapse of a support beam at a harbor construction site in Brazil (two contractors).

All the incidents involved employees and contractors performing their activities in operations and projects.

Vale offered full support to families and conducted investigations to identify the root causes of each event in order to analyze all the risks involved, and

Campaign

“Behind one life there are many others”

In 2011, Vale organized a Day of Reflection on Health and Safety to help promote the health and safety culture at the company. Vale employees around the world discussed the topic. This was the first such global mobilization of Vale's employees, and senior management played a major part. In all over 138,000 employees participated in discussions in 25 locations. As a result of the debates, each area made a critical analysis of issues where there is room for improvement in health and safety. Around one thousand actions were discussed worldwide, and work plans are being implemented for each area.

Another initiative carried out in 2011 was a global internal and external communications campaign spanning newspapers, magazines and television stations across Brazil. The purpose of the campaign was to highlight the importance of health and safety to Vale and to encourage health and safety improvements in the company's supply chain. Inspired by an internal assessment of “Proud to be Vale,” the campaign had a positive result, especially because it is not common practice in the sector to discuss the topic externally. In addition, the action reinforced the importance of health and safety as an element of sustainable development.

Employees
in iron mining
operations
in Itabira
(Minas Gerais),
Brazil



Injuries and fatalities in the workplace are unacceptable to Vale, whatever their causes

GRI Reference

Indicator: LA8

intensify efforts to promote a culture of prevention.

Workplace injuries and fatalities are not acceptable to Vale, whatever their causes. The goal is zero harm, with a focus on structured actions involving:

- risk assessment;
- employee and leadership;
- training;
- operating discipline;
- innovation;
- change management.

In 2012, Vale is focused on deploying its global health and safety management system and prioritizing areas that reduce the potential for fatalities.

As a reflection of the company's commitment to health and safety, the new administration has established an exclusive Health and Safety Department with a global reach. This will enable the company's strategy

Health and safety actions for employees and their families


Target group	Education/Training	Advice	Risk prevention/control	Medical treatment
Employees	Workshops for managers and employees on substance abuse and drug addiction; lectures and training on gender equity; cancer and diabetes prevention campaigns; HIV/AIDS transmission prevention campaigns; support groups for people with diabetes, hypertension and cardiovascular risks; lectures about quality of life and health promotion. Training on prevention of malaria; hearing loss due to noise; and various issues related to ergonomics.	Employee Assistance Program offering guidance on many health issues, including legal, financial, and interpersonal advice, advice on use of medicines and on psychosocial disorders and other diseases. Travel advice for employees on international assignments.	Primary, secondary and tertiary controls of malaria; inspections to control dengue and yellow fever; actions to promote health (such as prevention and treatment of drug addiction, fatigue, improving quality of life) and ergonomics; routine vaccinations for influenza, HPV and those recommended for each travel destination.	Clinics, first aid posts/stations and medical facilities
Families	Cancer and diabetes prevention campaigns; support groups for people with diabetes, people with hypertension and cardiovascular risk; HIV/AIDS and malaria prevention campaigns; workshops on substance abuse and drug addiction.	Legal, financial and psychological advice on different health and family issues. Monitoring of social assistance to families of employees with psychiatric illnesses or addictions to substances.	Various vaccinations; and inspections to prevent dengue, yellow fever and malaria.	Medical facilities

and initiatives to be implemented more effectively in all of the cultures where it operates.


Vale always aims to reduce accident rates and outperform benchmark indices in the mining industry, such as reductions in total accidents and lost-time injury rates. 

Integrated Health Strategy

A major initiative launched in 2011 was the Integrated Health Strategy, which establishes health as a strategic component for Vale, based on three pillars in the company's programs and initiatives: Occupational Health, Personal Health (Health Assistance) and Community Health.

The Integrated Health Strategy was developed in line with the company's strategic priorities in the health and safety area, aiming for zero harm and a healthy workforce at Vale. 

Differentiated health and safety actions

The diversity of health conditions in the locations where Vale operates means that different kinds of actions are needed. As a result, in 2011 a number of different training, advisory, risk prevention/control and medical treatment programs were developed for employees and their families and to reflect the needs of the communities where Vale operates, aiming to promote health and encourage preventive attitudes. 

Actions carried out at some of the company's units are shown above. Actions focused on community health are detailed on page 55.



Challenges

Achieve **zero harm**

Eliminate the deficit in education

Create relationships
of **quality and trust**


Innovation Based on a pioneering agreement with state research promotion foundations, the Vale Technology Institute (ITV) is supporting a range of research projects. These include a project focused on Health and Safety in Mining, in partnership with the Federal University of Minas Gerais (UFMG).

The aim of this initiative, which is currently being implemented, is to establish procedures and methodologies for analyzing situations in the workplace and assessing the workers' know-how. It includes training staff in the skills needed to research all aspects of the workplace.

The project is expected to be completed in the second half of 2013. It aims to create focus groups and establish dialogue between researchers from the medicine, engineering, education and psychology sectors and Vale employees.

Organizational learning

To facilitate organizational learning in the Health and Safety area, improve processes and prevent incidents, Vale shares best practices in company forums, publications, regular meetings and in other communications.

In 2011, around 80 initiatives considered to be examples of best practice were communicated with operational areas and projects. They included the establishment of ten sub-committees to discuss and define Health and Safety procedures, the training of internal auditors in health and safety, the development of behavioral dialogues and others. 

Award

For the sixth time in the last seven years, Vale has been awarded the John T. Ryan Trophy by the Canadian Institute of Mining in Montreal. The award was based on the performance of the T-1 and Birchtree mines, which had the lowest reportable injury frequency per 200,000 hours worked in Canada.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

Vale has assumed the challenge of eliminating deficiencies in the basic education of its employees at the technical and operational level. Currently, 8% of the company's employees in Brazil, or about 4,800³ people, do not have a certificate of completion of elementary and/or high school education. Vale's goal is to reduce this percentage to zero in the coming years. To achieve this, employees who have not had the opportunity before are given classroom education, in partnership with local educational institutions.

Another major challenge for the company's growth is to ensure that it has qualified workers for its operations, most of which are in areas that are far from urban centers and hard to access.

In an effort to engage company managers in employee training, the capacity-building goals that until last year were concentrated in Valer — Vale Education (the corporate university) apply to all Vale managers as of 2012.

Vale understands that it faces a significant challenge in this matter. To address this challenge, the company's education strategy aims to train all its employees and include the following educational models:

³ Employees in Brazil with a labor contract of an undetermined length.



Target

Guarantee that employees at the operational technician level have the certificate of completion of elementary and/or high school education




Technical, Management and Leadership Development plans, Development Maps, and Cross-Cutting Competencies. 

Vale continues to provide its employees with in company courses and in more specific cases with financial support for external training. The company is focused on developing the critical technical skills that its businesses demand from its employees.

Focus on education

In 2011, US\$68.6 million was invested in education in Brazil, 92% in courses in the country, enabling 78,342 professionals to be trained, 27% more than in 2010. The remaining 8% was invested outside the country. A significant result of this investment is the high percentage (90%) of management vacancies that are filled internally.

The average number of training hours at Vale increased by 39% (53 hours per year) due to the company's enhanced focus on training its employees and the development of its Global Training Management System, which improved the recording of information on a single database. 

Human rights

In 2011, to raise awareness about the guidelines of the Human Rights Guide, Vale initiated a cycle of training for employees to debate and discuss issues related to human rights abuses. Initially, training was provided to regional teams who work most closely with this area (in particular, the Human Resources, Legal, Security and Community Relations areas).

In 2012, as well as providing classroom training to new students in Brazil and overseas, the company plans to launch an online course to support the increasing visibility of human rights at Vale.

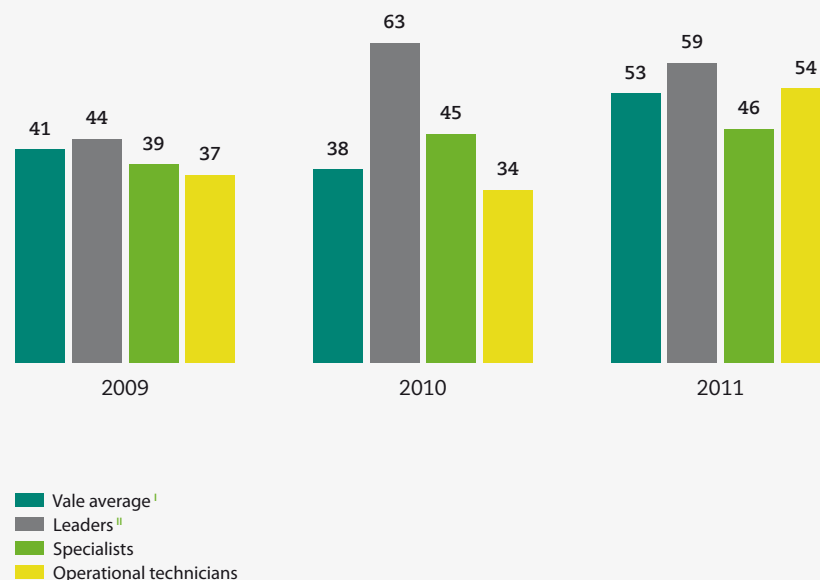
Corporate security

Since 2008, Vale has provided annual training in safety and human rights to corporate security teams and every two years it organizes refresher courses for the area. This action forms part of the company's Global Human Rights Policy.

In 2011, more than 4,030 corporate security contractors and more than 230 Vale security employees completed these training courses. This represents 80% of the company's global security workforce. In Brazil, 89.5% of corporate security professionals received training. Courses were provided in Canada, France, Norway, Mozambique, Taiwan, Japan, New Caledonia, Peru, Paraguay and Brazil.

A continued challenge for Vale's corporate security area is to extend increased training to its units outside Brazil and to support respect for human rights in the highly diverse cultures where it operates.

Training hours



^I The average number of hours a year is calculated by dividing the total number of hours of training by the number of employees. Employees covered by this indicator (LA10) correspond to 95% (2009), 87% (2010) and 98% (2011).

^{II} The Leadership category includes supervisors, general managers, directors and executive directors.

Indigenous communities

To ensure that Vale can meet the challenge of anticipating problems and mitigating any legal disputes with indigenous communities, it is a strategic priority for the company to provide training to its operational areas. Vale increased the number of employees who manage relations with traditional communities and held training sessions and internal seminars.

In November 2011, all Vale professionals who work in the area attended the International Seminar on Vale's Relations with Indigenous Peoples. This pioneering event facilitated the exchange of experiences and best practices between employees and helped to align the company's global management of this issue. 

GRI Reference

Indicators: LA10, HR3, HR8
Profile: 4.16

Relationships built on trust

Vale is aware that the cultural integration of its operations in different regions of the world remains a work in progress. This is an issue that is extremely sensitive for the company's employees. Vale has realized that there is a significant difference between having operations in many regions and having a truly global culture. One of Vale's challenges currently is to understand, respect and win the confidence of employees from all over the world.

The company has assumed the commitment to actively seek to engage all of its employees and to create high-quality relationships based on trust and confidence, which will help the company and its employees "Improve together".

Reflecting this commitment, in 2011 Vale carried out its first global survey of employees, across the entire organization (in eight languages), using both printed questionnaires and online forms⁴.

56,445 employees participated in the survey and the final results showed that 84% of participants felt a sense of engagement. Despite this achievement, Vale will continue to strive for more positive results.

To guarantee that all areas for improvement are addressed and resolved, Vale's managers met with their teams to interpret the results and prepare action plans. Already, more than 3,500 actions have been implemented and have been recorded online. These include the following: improving dialogue between different company departments; enhancing relations and demands made between corporate areas (mainly in Brazil) and business areas; improving the guidance given to employees about their performance; and developing a system for collecting ideas and suggestions from employees. The next global opinion survey is planned for February 2013.

As a Brazilian company with a global reach, Vale is committed to respecting local characteristics and cultures. In Canada, where the rate of employee

⁴ Until 2010, only local surveys were carried out.



By investing in people and identifying talent at all levels, the company is preparing for future challenges

Maria Gurgel, Global Director of Human Resources and Governance

Vale's Human Rights Policy and the Code of Ethical Conduct reinforce the company's position of not tolerating discrimination

participation in the global opinion survey was only 56%, and in Indonesia, where it was 84%, Vale is aware that it has experienced difficulties and is working towards a solution.

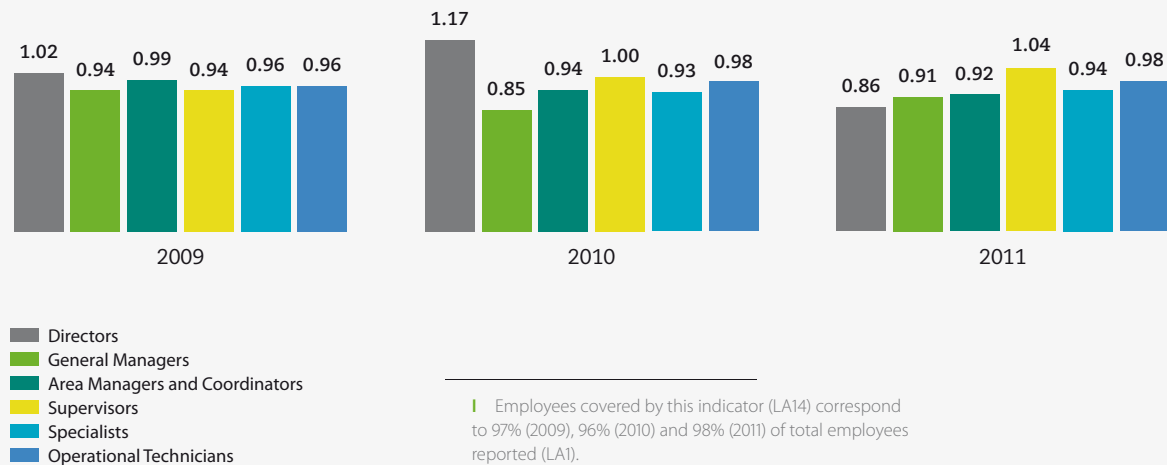
Respecting differences

Vale does not tolerate discrimination whether based on ethnic background, origin, gender, sexual orientation, religious belief, union affiliation, political and ideological conviction, social class, disability, marital status or age.

Vale always looks to employ local workers whenever possible (for more information about Vale's local hiring practices, see the Community section, on page 52), respecting and encouraging diversity and equality in its workforce.

This commitment to diversity is also reflected in the company's benefits policy,

Proportion of women's salary to men's, by functional category¹



Recognizing and promoting the talent and ability of women, reducing their historic and cultural difficulties in accessing opportunities, is one way of fulfilling Vale's vision

which acknowledges same-sex partners. In this and other areas, Vale's commitment to diversity includes establishing dialogue with the culture of each country where it operates.

Vale progressed in 2011 by increasing the proportion of women employed at the company by 28%, to 12.3% of all employees. This is a major achievement for a mining company, a sector in which the workforce is predominantly male.

The largest proportion of women, 48%, hold technical positions (operational and administrative jobs), followed by specialists (analysts, engineers, geologists, etc.) with 45%. In supervisory and management positions, the proportion of women remained stable, at 3%.

Top management — the Executive Board, Board of Directors and Fiscal Council⁵ — consists of 36 people (35 men and one woman). Twelve of the members are in the 30 to 50 age bracket, while 24 are over 50 years of age.

In accordance with Vale's Remuneration Policy and Code of Ethical Conduct,

there is no difference in the base salary between women and men who occupy the same role. The variation in the chart above is due to the different seniority and experience of employees within their employment category.

Diversity

Every person has unique talents and possesses the capacity to strive for their personal and professional development. Achieving diversity in the workforce is one way of creating long-term value.

Since 2004 Vale has been reinforcing its commitment to respecting diversity, through its Inclusion Program for People with Disabilities, coordinated by Valer — Vale Education and the regional human resources areas. In order to comply with Law no. 8,213 (July 25, 1991), which requires reserving vacancies for people with disabilities, Vale has a goal of hiring 140 such professionals every year.

In 2011, it hired 185 people with disabilities, fulfilling Vale's Conduct Adjustment Agreement with the Brazilian Public Prosecution Ministry. In addition to the opportunity to access the labor market, these professionals have also benefited from theoretical and practical training entirely financed by Vale.

GRI Reference

Indicators: LA13, LA14

⁵ Position in 2011.



An employee
at Big Nickel,
in Sudbury,
Ontario, Canada

Integration

Re-engaging Employees in Canada

The results of the employee engagement survey were not as positive in Canada as in other countries. Vale accepts these results and acknowledges that the integration of its Canadian operations over the last few years has resulted in significant changes for its employees. Vale recognizes the importance of strengthening its understanding of the local culture and local realities, especially during changes.

Today, the company is well aware of the need to restore trust. Vale wants to re-establish full communications between the company, its employees and union representatives. The company knows this may take time and is fully committed.

Vale has ambitious investment plans for Canada and believes it is essential to build trust and continuously engage its employees.

After carrying out consultations with its managers, human resources teams and with disabled employees themselves, Vale identified new opportunities and reviewed and extended the scope of action for disabled people, extending the program to other functions at the company, and not just to operational and administrative roles.

The aim is to develop and harness the potential of people with disabilities and to put into practice one of Vale's core values, which is to "Improve together". Currently, in operations and offices in Brazil, 62% of disabled employees carry out operational activities and 38% are employed in administrative and specialist roles.

The next goal of the program is to eliminate physical barriers. The company is already studying an accessibility policy that will be launched in 2012 and will be used in all of Vale's infrastructure and construction plans and projects to ensure that the company's global operations take into consideration access for people with disabilities. The first tangible results should start to be seen in 2013.

Gender Equity

In 2011, Vale established a project aiming to encourage reflection on the issue of gender equity. Vale used workshops, debates, films, and exhibitions of photographs showing men and women working in the same positions at the company, to help it understand how its employees perceive the gender topic. The company believes that it will be possible to implement its initiatives and strategic actions in ways that are aligned with the real needs of men and women, and that make the most of the capacities of every person at Vale.

Since its establishment, this project has already carried out actions in 24 locations in Brazil, involving the participation of around 1,200 employees. A committee consisting of representatives of Vale's leadership is responsible for multiplying the effects of the project, stimulating debate about the topic and proposing and validating actions with a positive impact on the company.



Women in Sohar, Oman, where Vale has operations

Vale understands that working in different countries and cultures is a challenge, but also an opportunity, because of the advantages of having a diverse workforce


GRI Reference

Indicators: HR4, EC5, LA2

Fighting discrimination

In 2011, 62 cases of discrimination were reported: 34 in Canada and 28 in Brazil. The company believes that the 23% increase in the number of cases from the previous year is due to improved reporting channels.

In Canada, just one case of discrimination has not been fully resolved, as the employee is yet to complete a six-month orientation course. In every case, measures were taken in response to the discrimination identified, involving investigations, guidance, training and disciplinary measures.

In Brazil, 14 cases were investigated and resolved, while others are still being analyzed. In some cases, employees were dismissed. Vale has a Reporting Channel to also guarantee human rights. 

Remuneration and Professional evaluation

A major part of an employee's satisfaction is based on receiving fair compensation. Each year, Vale carries out a survey of salaries in regions where it operates to ensure that its compensation packages remain attractive and competitive in the local market. Vale respects the legal minimum salary in each location. The company's methodology and philosophy for remunerating its employees are applied in a standardized way across all regions and are generally based on performance rather than length of service.


The company's Total Remuneration philosophy aims to provide its employees with a competitive remuneration package, comprising monetary remuneration, benefits and a working experience that attracts and retains the best talents.

In order to develop a culture that is constantly driven by results, each employee's remuneration package includes the payment of a variable bonus. The bonus that an employee receives is calculated in accordance with his or her individual performance, that of their team, department and company, and is also determined by issues related



We operate in various locations, with a range of ethnicities and cultures, and we must make the most of this to become a better company


Tito Martins, Executive Officer of Finance and Investors Relations

to sustainability, such as health and safety, and the targets of the Action Plan on Sustainability (PAS) which are described in the Strategic Vision section from pages 16 to 19. 

Decline in employee turnover

Employee turnover is a very important indicator of the satisfaction of the company's employees. The trend for increasing retention of the company's employees has been confirmed by the decline in the global turnover⁶ rate from 6% in 2010 to 4.7% in 2011.

Vale's talent retention policy is based on programs that support the development of local infrastructure (health, education, housing and leisure), continuous education, and performance, career and succession management. The latter issue is based on a process of engaging employees and providing them with feedback on the results they have achieved. By assessing an employee's competencies, performance and career aspirations, the company aims to ensure that the right person is in the right job.

The turnover rate for women (5%) was similar to the rate for men (4.7%), and their percentage of dismissals (13%) is in proportion to their total share of the Vale workforce (12.3%). 

In Australia, the turnover rate increased from 9.5% (2010) to 19.1% (2011) in an extremely competitive labor market in which there is a shortage of labor and an imbalance between supply and demand. The results of the latest Resources Industry Turnover Analysis (RITA) Report (April 2011) show that employee turnover in the resources sector increased from 13.8% to 20.9% per annum in just six months since the last survey. In New Caledonia, the increase in the turnover rate was due to the hiring and then release of people during the test phase before the start of operations at the project.

To achieve the company's goal of becoming one of the best places to work, to improve employees' quality of life and to reduce the employee turnover rate, in 2012 Vale started to carry out a series of actions aiming to improve the work/life balance of its employees. The first initiative in this effort was an internal campaign that provided information about the importance of taking breaks and vacations, playing sport and eating healthy food.

⁶ The employee turnover rate corresponds to the total number of employees that left the organization, whether voluntarily or not (including retirees), divided by the total number of employees.


Freedom of association and negotiation

Vale respects the freedom of its employees to form associations and to participate in negotiations. Good relationships with unions are a priority for Vale and the multi-year agreements that have been signed reflect improvements in these relationships.

Social dialogue with unions and other labor associations is at the center of Vale's relations with its employees. Over the last three years, Vale has increased the range of its social dialogue events with nearly all worker representatives in Brazil.

Decent working conditions

Since 2007, Vale has been a signatory to the United Nations Global Compact, and it respects the laws of the countries where it operates and the eight fundamental conventions of the International Labor Organization (ILO), in accordance with the list of conventions in the following table. Vale also participates in global working groups that aim to guarantee compliance with the principles and fundamental conventions of the ILO, such as the abolition of forced labor and child labor and an end to discrimination.


In 2012, the company intends to involve all categories of workers in this dialogue, both in and outside Brazil. 

In 2011, the percentage of employees covered by collective bargaining agreements was 95%, the same level as in the two previous years⁷. In international operations, such as Canada⁸, Australia, Peru and Norway, employees covered by collective agreements are those who opt to be union members. At Vale Australia, 72% of employees are covered

An employee
in mine operations
in Tete,
Mozambique



by collective bargaining agreements. Due to changes in local legislation, current individual agreements are being replaced by collective agreements and a collective agreement with a three-year duration was signed in 2011.

In 2011, a major development was the working agenda agreed in Canada⁹ with the unions that represent employees in the country. 

Health and safety progress through working with unions

Vale will spare no effort to significantly improve health and safety in the workplace. Fatalities are not acceptable. The company has adopted a number of initiatives, and is working to improve on practices that lead to tangible gains. These include looking to engage trade unions on matters of health and safety. Specific measures have recently been adopted which have set the company on a quest for zero harm.

Discussions and engagement with trade unions encompass the specific concerns and views of employees' representatives, which determine mechanisms and requirements for preventing incidents and occupational diseases, such as machinery training, the provision of personal protective equipment, regular inspections and the maintenance of joint health

⁷ Employees covered by this indicator (LA4) correspond to 97% (2009), 96% (2010) and 95% (2011) of total employees reported (LA1).

⁸ In Vale Canada and its subsidiaries, 78% of employees were covered by collective bargaining (in 2010, the proportion was 80% and in 2009, 81%).

⁹ In 2011, no new strike or lockout was registered. The strike in Sudbury, Canada ended in July 2010, although workers at the Voisey's Bay unit only returned to work at the start of 2011.

GRI Reference


Indicators: HR5, MM4, EC3
LA3, LA4, LA9

ILO Conventions

No. 29	Forced Labor, 1930.
No. 87	Freedom of Association and Protection of the Right to Organise, 1948.
No. 98	Right to Organise and Collective Bargaining, 1949.
No. 100	Equal Remuneration, 1951.
No. 105	Abolition of Forced Labor, 1957.
No. 111	Discrimination, Employment and Occupation, 1958.
No. 138	Minimum Age, 1973.
No. 182	Worst Forms of Child Labour, 1999.

Vale strives to extend its benefits to all the locations where it operates, in accordance with the characteristics of each region

and safety committees. The right to refuse to work in unsafe conditions is guaranteed and reinforced by Vale's Risk Analysis and Management Instructions (INS-37).


In 2011, two workshops were held with unions that represent Vale employees in Brazil, in order to guarantee a transparent, open working environment that is conducive to continuous improvement. The planning process for 2012 has maintained and extended this dialogue. 

Benefits


Vale offers a range of benefits, which as well as complementing total remuneration also provide increased protection and security to employees and their families. The purpose of these benefits is to attract and retain good professionals in the company workforce.

In 2011, Vale approved and publicized its Global Standard, which aims to ensure that these benefits are offered on a

consistent basis in all of the different locations where the company is present. This standard also aims to implement the business' strategic objectives in each location, express the principles of the company's human resources philosophy, and guarantee that the country's legal requirements and local market conditions are respected.

Vale provides medical insurance and life insurance to 100% of its employees. Benefits such as accident insurance, private pensions, transportation allowances, education and training, meals at work and or food assistance and the Employee Assistance Program are offered to a significant number of employees (91%). 

Pension plans

Vale provides its employees with complementary private pension plans that aim to ensure they have an additional income when they retire, in accordance with the Global Standard on Benefits. 



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011



Commitment

To respect and understand the neighboring communities of its operations and projects, including their cultural diversity, and to support their development and leave a positive legacy

.....



+7,900

housing units began construction, as a result of municipal projects supported by the Vale Foundation

US\$165 mn

was the total spent in controlling and **reducing** air emissions

21

the number of traditional communities that Vale interacted with in 2011

Communities

Vale regularly operates in remote regions that are often lacking in infrastructure and qualified workers.

In this context, it is essential for a large company such as Vale, which is committed to sustainability, to listen to local communities and invest in their socioeconomic development, respecting their needs and requirements. Vale's experience confirms that a "social license to operate" is as important as an environmental license, and is a critical part of enabling the growth of Vale's operations and the development of a region's communities.


Every year, the company strives to enhance its engagement with communities and establish transparent relations that are based on trust. Vale establishes channels for dialogue, identifies its impacts (both positive and negative) and creates action plans to improve its operations in these locations, involving investments in health and safety, education, infrastructure and local income creation, and the preservation of ethnic and cultural diversity.

Vale's presence in a region

Vale carries out socio-economic research and assessments to enhance its understanding of the regions where it is present. These assessments identify the requirements and potential of each

The company believes that doing the right thing and earning a "social license to operate" is of benefit to itself and also to its stakeholders in the community, enabling prosperity and sustainable development, in accordance with the company's Mission

territory and Vale's participation in the region's dynamics. Vale measures the impacts of its operations using Social Investment Management Plans (PGIS, in Portuguese).

These assessments have so far been carried out in operations in Brazil, Mozambique, Oman, Peru, Guinea, Liberia, Australia and Indonesia. [Based on these assessments, the table on page 47 shows the main positive and negative impacts that Vale's presence in a region can lead to.](#) 

Air emissions and noise

Vale recognizes that its activities generate emissions of particulate matter, and noise and vibrations, which could impact the quality of life of communities that are close to its operations. The company is committed to maintaining these impacts at acceptable levels by striving for the continuous improvement of its processes for controlling these emissions by using more efficient technologies. In 2011, Vale spent US\$165 million (16% of its total environmental spending) in controlling and reducing its air emissions.

GRI Reference

Indicator: SO1, EN29



Authors of the case study: Dave Marshall, Brian Macnamara, Dave Stefanuto, Sue Tessier, Ed Cocchiarella

Case Study

Clean AER Project reduces emissions of SO₂ and particulate matter

Vale is heavily engaged in reducing its emissions of sulfur dioxide (SO₂) and particulate matter into the atmosphere, as part of its commitment to people and the planet. As an example of this commitment, the company is investing in the Clean Atmospheric Emissions Reduction (AER) project in Sudbury, in Canada.

With a total investment of US\$2 billion, the project aims to reduce sulfur dioxide (SO₂) emissions from the nickel smelter by 70%, bringing emissions down to 45,000 metric tons per year. Thanks to Clean AER, Vale's emissions will be well below the maximum level of 66,000 tons per year that the Canadian federal and Ontario governments are establishing for 2015 and beyond.

In the last four years, Vale has already invested about US\$100 million in the project in research and technological innovation. Clean AER will also reduce emissions of dust and metals by between 35% and 40%. It is expected to be completed by the end of 2015.

This is one of the largest ever environmental investments in the history of the province of Ontario, and the largest ever in Sudbury. In addition to its investment in adapting the smelter complex, Vale also expects that peak construction work will employ 1,300 workers.

These reductions in emissions are in line with Vale's other actions in its long history in Canada. Since 1970, the company has worked hard to cut its emissions of SO_x, which have fallen by around 90% in this period.

Vale has taken a number of steps to reduce its air emissions, including establishing a management unit for air emissions, noise and vibration in 2011. The aim of this unit is to support projects to control emissions, stimulate research, develop alternative technologies, participate in national and international debates and contribute to the formation of regulatory mechanisms.

Another important institutional change in 2011 was the creation by Vale of the Subcommittee on Air Emissions. This is designed to facilitate relations and the exchange of experiences between corporate and operational areas and to develop documents that support the company's strategy for managing air emissions. These include Vale's Management Standards for Systems (PGS, in Portuguese), which establish guidelines for Brazilian operations to manage their air emissions, and the Global Instruction of 2012, which will aim to improve the management of air emissions in all operational areas, in accordance with the legislation of each country in which Vale operates.

Vale discloses all of its emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x) and particulate matter (PM) from stationary sources. These substances have no global effect but impact on air quality in operations' regions.

The company has implemented a range of initiatives to optimize its management and control of particulate matter emissions from diffuse sources, which Vale believes to be one of its greatest challenges. Vale has completed the construction of wind fences¹ in the stock yard at the Tubarão Complex (Vitória-Espírito Santo), and has also deployed this technology at its pelletizing plant in Oman. At these units, the company has installed equipment that encloses the structures where material is transferred from conveyor belts, reducing dust emissions.

Vale is also developing dust-suppressing equipment in partnership with specialist companies. This equipment will help reduce diffuse emissions in storing, handling and transporting material.

¹ A barrier that reduces the speed of wind.



Using our detailed understanding of the impacts of our projects and operations, and working with the communities, we aim to reduce negative impacts and maximize positive impacts

Isis Pagy,
Community Relations Director

Potential impacts



Direct

- Job creation (see more in Local Hiring)
- Vocational qualification (see more in Internal and External Capacity Building)
- Purchase of local products and services (See more in Local Purchasing)
- Investments in services and infrastructure (See more in Social Spending)
- Increase in government revenues (See more in Added Value)

Indirect

- Generation of indirect jobs
- Increase in salary payments
- Suppliers attracted to the area (see more in Local Purchasing)
- Development of local suppliers (see more in Local Purchasing)
- Investment attracted from various public and private sources
- Other economic sectors boosted
- Economic development
- Local infrastructure improved



Direct

- Interference with land use (See more under Land Use)
- Environmental impacts: emissions (See more under Air Emissions and Noise)
- Noise (See more under Air Emissions and Noise)
- Risk of accidents (See more under Health and Safety)


Indirect

- Real estate speculation in remote areas
- Pressure on infrastructure and public services
- Alteration of air quality
- Consequences for community wellbeing generated by environmental impacts
- Generation of economic leakage effect due to hiring of suppliers and employees from other regions because of a lack of local skills

At Vale Manganês S.A.'s Ouro Preto unit, a project is being implemented to reduce its ferroalloy furnace's air emissions. This is a pioneering project that uses a dust filter in a closed furnace instead of a conventional gas scrubber. This reduces water consumption, avoids treating effluent generated, and reduces the generation of waste in the process. Dust from the filter can be handled easily, compared with the slurry generated from the gas scrubber. The estimated investment is US\$17 million and the system is expected to start operating in 2012.

At the company's nickel units in Sudbury, Canada, the Clean Atmospheric Emission Reduction (AER) project is a US\$2 billion initiative to reduce particulate emissions by 40% and SO₂ emissions by 70% by 2015. Read more in the case study on the opposite page.

Particulate matter, SOx and NOx

Total particulate matter emissions were 9,500 metric tons in 2011, generated mainly by the pelletizing, nickel and fertilizer units. This is a 43% increase from 2010, due mainly to the increase in pellet production and the inclusion of the phosphate and nitrogen fertilizer assets, which were reported as of 2011. Vale also monitors SOx and NOx emissions². 

GRI Reference

Indicators: EC9, EN20, EN29

² Emissions of particulate matter, NOx and SOx from the phosphate and nitrogen fertilizer assets were reported starting 2011, although these assets were incorporated by Vale in 2010.

The balance of particulate matter emissions was obtained by monitoring data on stacks at operating units and, in certain cases, through the application of emission factors calculated based on operating parameters. Mobile and diffuse sources were not included in the report, since there is no specific and acknowledged methodology for calculating or measuring them.

Environmental Compliance

Vale manages environmental compliance based on continuous monitoring and assessment. The search for more agile solutions for possible occurrences is also ever present at the company.

Promoting development

Vale understands the need not only to provide support for its operations but also to contribute to the development of the regions around them and help these regions develop an economic life that is independent of mining.

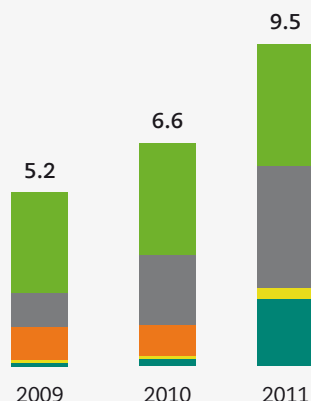
Vale aims to stimulate the use of the resources generated by mining, such as higher tax revenues, job creation, higher salaries and household income, to generate new opportunities in these regions, reflecting each region's characteristic products and services. A major part of this effort is focused on reducing local deficits in qualified workers and suppliers and diversifying the local economy.

Involuntary relocation

The involuntary relocation of communities is often inevitable in mining and logistics activities. To minimize the disruption and negative impacts in such cases for any families that are affected, Vale has established a document regulating these activities in Brazil, which is used as a reference in other regions where the company operates: its Terms of Reference on Relocation Processes, which establishes the processes to be followed to manage the social impact of involuntary relocation of families in an economically vulnerable situation.

Particulate matter emissions ¹

In thousand metric tons



	2009	2010	2011
Nickel	3.0	3.3	3.6
Pelletizing	1.0	2.1	3.6
Aluminum	1.0	0.9	–
Manganese	0.1	0.1	0.3
Fertilizers	0.1	0.2	2.0
Total	5.2	6.6	9.5

¹ Emissions from coal and copper were not considered significant.

Involuntary relocation

(2011)

Name of Project being extended/implemented	Location where there was involuntary relocation	State/Country	Number of households relocated
Itabira complex	Vila Paciência Neighborhood	Minas Gerais/Brazil	69
Onça Puma Operating Unit	Campos Altos and Tucumã relocation projects	Pará/Brazil	12
Moatize Coal Project	Bwamimba	Tete/ Mozambique	7
Potasio Rio Colorado SA	Cañadón Amarillo	Mendoza Province/ Argentina	5

The document describes the methodology and establishes the guidelines for the relocation of families. It aims to support the implementation of projects, guaranteeing alternatives for each family and taking into account the specific characteristics of each case, in order to improve and maintain their quality of life.

In accordance with this procedure, in 2011 Vale carried out 93 actions, mostly in Brazil, involving the various forms of involuntary relocation: resettlement, relocation with compensation, or simple compensation.

Resettlement in Mozambique

Vale Mozambique has carried out a resettlement program for families who

GRI Reference

Indicators: MM9, EN28



Challenges

Share value

Leave a **positive** legacy

Vale continuously strives to enhance its engagement with communities

lived in areas that are affected by the extractive and industrial activities of the Moatize Coal project. This program, which was based on regular dialogue with the government and with local communities, was concluded in 2010 with the relocation of 1,365 families.

Based on various studies, two areas were chosen to receive the families: Cateme, a rural area, and 25 de Setembro, an urban area.

The local community was fully engaged in the process of preparing the Resettlement Action Plan, with three public hearings, 20 presentations in the main local language (Nvungwei), 110 meetings with the community and its leaders, using illustrated materials and other aids, as well as 4,927 home visits for mobilization and social care (families and leadership) and 639 social services actions, by the start of the resettlement.

³ Delivery of the Health Center for 25 de Setembro, purchase of an ambulance, and infrastructure for managing HIV/AIDS.

⁴ Delivery of an additional area for agriculture and donation of fruit tree saplings and seeds.

As part of the implementation of the Moatize Coal project, in addition to the houses that were constructed in Cateme and in 25 de Setembro, the following infrastructure was also provided for the community: a primary school, a library, houses for teachers and the school director, a secondary school, a computer room, a laboratory, a health and maternity center, and a police station, as well as roads and electricity supply.

For example, in Cateme, Vale has constructed two schools that are administered by the District Education Department. One of these, the Cateme Elementary School, has capacity for about 1,200 children, with 18 classrooms and a library. Meanwhile, the Armando Emílio Guebuza High School has capacity for about 650 students, with twelve classrooms, a library and a boarding house for 270 students, as well as a computer room and one hectare that the Model Farm has donated for classes in horticulture, composting and processing manioc flour.

Vale Mozambique recognizes that improvements need to be made to the infrastructure of these new settlements and it is deeply involved in carrying out actions to support these families, in cooperation with governmental authorities, to meet the needs of the resettled communities.

To respond to the issues that have been raised, Vale has already begun to repair homes, maintain drainage systems and roads, improve the water supply system and the electricity network and build sports infrastructure, as well as investing in health³ and agriculture⁴ and developing solutions to support public transport. In addition, Vale is also carrying out actions to help establish alternative sources of income, such as poultry and beekeeping, and is investing in agricultural and vocational training.

Vale Mozambique remains focused on enhancing its relations with local authorities and communities and on continuing with the social investments it is making to support sustainable local development.



.....

The social license to operate
is essential for Vale to carry out
its activities and build trusting
relationships with communities

Peter Poppinga, Executive Officer of
Base Metals and Information Technology

The Vale Foundation

The Vale Foundation's mission is to contribute to integrated economic, social and environmental development in the regions where Vale operates, providing and leveraging social investment, strengthening communities' human capital and respecting local identities.

The strategy of the Vale Foundation is to make structured social investments that are aligned with public policies in partnership with civil society and with a medium- and long-term focus. The Vale Foundation is a leader in establishing public-private partnerships that serve to maximize local potential.

Public-private social partnerships

The Vale Foundation's strategy is based on the concept of public-private social partnerships.

The purpose of public-private social partnerships is to contribute to community development by combining the efforts, resources and know-how of governments, companies and civil society around a shared vision, generating structured, sustainable social results in the medium and long term.

Partnership agreements take the form of a memorandum of understanding in each municipality, which enables an integrated planning process to be established with local authorities, with the agreement of common goals and reinforcement of social investments.

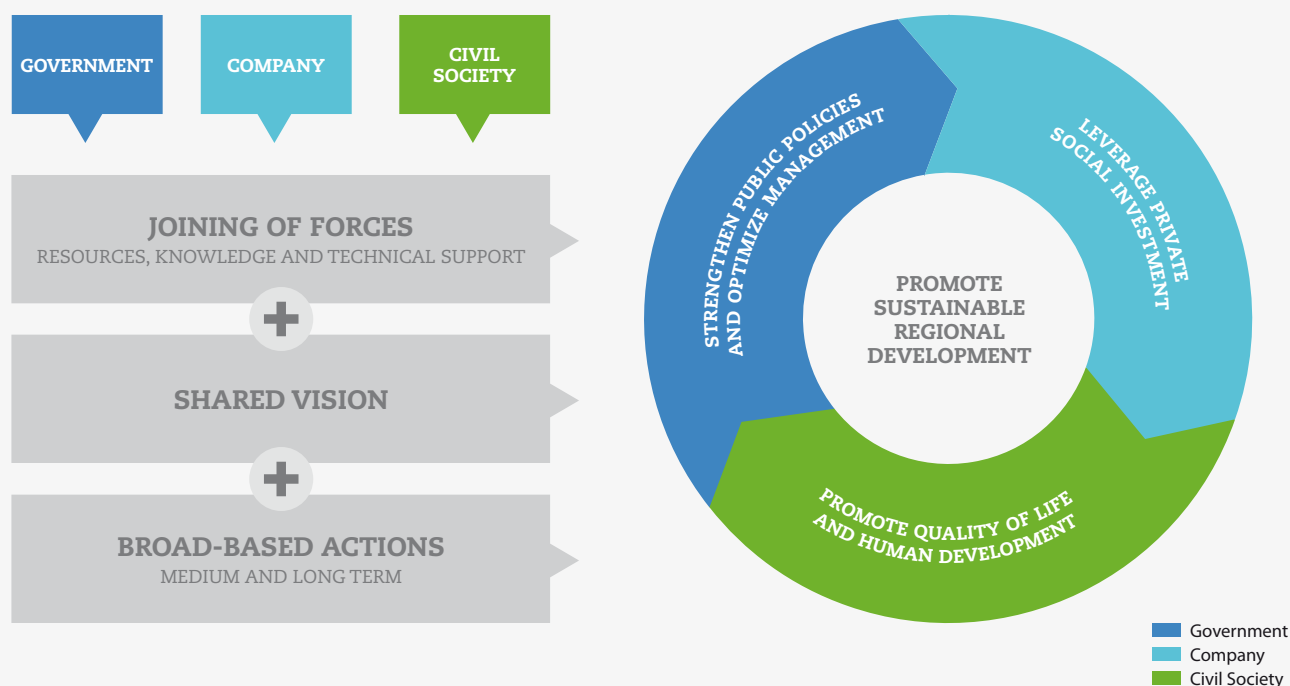
The Vale Foundation acts to support Public Management and Human Development. There are two elements to its work with the public sector; training and technical advice. It acts in the following areas:

Institutional Support – The Foundation's goal is to contribute to modernizing the administration of the municipalities in the areas of planning and management, in order to improve citizen services, update the land registry, train municipal civil servants, and other important areas of local public policy.

Urban Planning – The Foundation's goal is to prioritize initiatives that enhance the capacity of municipalities to plan integrated actions in housing and basic sanitation (water supply, sewage treatment, solid waste and drainage). In these two areas, the Vale Foundation carries out the following actions:

housing – Social Interest Housing Plans: training and

Public-Private Social Partnerships



enhancing of councils and municipal funds: regularizing the land registry;

sanitation – Municipal Sanitation Plans and Solid Waste Plans (including waste sorting and different alternatives for disposal); new management instruments.

In 2011, seven Brazilian municipalities benefited in this area from the company's actions, which provided support for the implementation of projects of the Brazilian government's Growth Acceleration Program (PAC, in Portuguese) designed to improve infrastructure and housing. In municipalities, 59 projects were approved and 29 are being implemented, covering 7,954 housing units (2% of the total for PAC2 in 2011) and representing an investment of US\$337.5 million (6% of the total for PAC2 in 2011).

In its work in the Human Development area, the Vale Foundation acts in the fields of education, health, sport and culture.

Vale's social spending in 2011 was US\$457.2 million

In 2011, the social programs managed by the Vale Foundation invested a total of US\$78.3 million. 

Social spending

In 2011, Vale spent US\$457.2 million in the area of infrastructure, education, sport, culture, income generation, health and strengthening of social capital, including programs of the Vale Foundation, partnerships with the public sector, sponsorship and donations in Brazil and other countries. Of the total spent in 2011, 89% was voluntary and 11% mandatory.

Of the total, US\$ 41.2 million (9%) was spent in infrastructure improvements, as illustrated in the chart on the following page.

Total social spending

US\$ Million



Infrastructure spending

US\$ Million

		2009	2010	2011
By Kind ^I	Support to Public Services	60%	19%	49%
	Implementation of building work	40%	81%	51%
	Pro bono	1%	1%	0%
By Format ^{II}	Commercial engagement ^{III}	26%	20%	35%
	Materials/Services ^{IV}	73%	80%	64%
Total		31.4	52.6	41.2

^I Support for public services, implemented by paying for services, such as the cost of hiring nurses and teachers, or paving work and the building of schools and hospitals.


^{II} Pro bono work to benefit the public, such as the allocation of people with specific functions to activities during the time scheduled for the work, using company resources.

^{III} An activity that generates public benefits, but which primarily gives an economic or investment return to the company.

^{IV} Investment in infrastructure in kind, to provide services to deliver a product.

GRI Reference

Indicators: EC7, EC8

In addition to this, the Vale Foundation also invested US\$9.2 million of donations from Vale in infrastructure. 

Local Hiring

As part of its commitment to its value of "Improve together", Vale invests in the capacity building and hiring of local workers, which contributes to promoting the socioeconomic development of the locations where the company is present. This can also generate benefits for the company itself, by reducing the employee turnover rate.

In 2011, local hiring⁵ represented 62%⁶ of total hiring within Vale. For leadership positions, the percentage was 34%. Both percentages were lower than in 2010, when they were 79% and 50% respectively. This decline is due to the amount of acquisitions made last year. The company's growth has led to increased demand for leaders in specific areas, while the regions where the projects are located are often unable to supply qualified professionals in time for project implementation.

In Mozambique, for example, Vale develops training programs for local communities (see the Gateway programs on the next page for more information). In this country, the percentage of locally hired employees in 2011 was 80.6%, with 27.4% of senior management coming from the local community.

Vale recognizes that there is still much work to be done to promote significant development in the regions where it operates. The company has taken on the challenge of respecting local realities and requirements, while also identifying and implementing more effective initiatives that reflect the specific needs and vocations of each region.

⁵ Although the indicator calculation considers employees to be local if they were born in the state, the hiring practice adopted, where applicable, prioritizes residents of the state, and not necessarily those merely born there.

⁶ Employees covered by this indicator (EC7) correspond to 99% (2011) of total employees reported (LA1).



Employee on a Vale train on the Vitória to Minas railroad, in Vitória (Espírito Santo), Brazil

The Professional Training Program aims to qualify the workforce and to support local development by providing access to education, employment and income

Gateway programs

As part of Vale's commitment to build the capacity of the people who work in its operations, especially in the communities where Vale is present, the company has established "gateway" programs which consist of a series of actions and courses with specific goals, all focused on vocational training to prepare people to join the company's workforce.

Since 2008, in partnership with local institutions, Valer — Vale Education has been offering postgraduate to provide specialist training to graduates, including the following programs:

Recruitment for capital projects

– Applied in Brazil, this program aims to hire and train engineers in the labor market to work on implementing projects, supporting Vale's capital projects.

Postgraduate Training in Ports, Postgraduate Training in Railroad Engineering, and Specialist Training in Mining

– This program is run in Brazil and internationally, and aims to develop engineers and geologists in the regions where Vale operates, contributing to supply the specialist professionals required by the company. The program is focused on mining, railroads and ports.

For the technical/operational segment, the Vocation Training Program (PFP, in Portuguese), which is run by Valer — Vale Education in partnership with Regional HR education teams, currently represents the main gateway into the company for young people looking for operational and technical roles.

The PFP has been run by Vale since 2004. Its objective is to train the workforce and to support local development by providing access to education, employment

and income. The program trains technicians, mechanics and operators. Its impact on the communities where Vale operates has been significant, contributing to an increase of up to 60% in the household income of participants during the training process.

In 2011 there was a 40.5% increase in the number of technical and operational trainees who were trained by the PFP, with 3,066 participants compared with 2,182 in 2010.

The proportion of PFP participants joining Vale in Brazil was 76.9% in the 2011 intake. This percentage represents the total number of students who joined the company in 2011 following the completion of the 2011 classes.

In Rio de Janeiro, one of the Brazilian states where the program was implemented, 27 people participated in the 2011 intake, with 81% of them joining the company. This led to the program being recognized with an award from the Rio de Janeiro branch of the Brazilian Association of Human Resources (ABRH-RJ). The award commemorates successful practices in people management that have had both quantitative and qualitative results.

The program also enabled 75 young people from Mozambique to come to Brazil to carry out on-the-job training in the railroad operations of the Centro-Atlântica Railroad (FCA). The PFP was offered to all Vale technicians in Mozambique, where the company is investing in improving the quality of education in the provinces where it has operations. Vale acted in partnership with the government, with the objective of training residents of the region.

To address the challenge of growing while being able to access a qualified pool of labor, Vale fully understands the importance of investing in vocational training in the sector.

Participation in gateway programs

Program	Objective	Scope	Participants in 2011
Vocational Training Program	Trains young people for their first job in operational and administrative activities at Vale	Brazil	3,066
Internship Training Program	Trains students in technical and higher education, based on practical experience at Vale	Brazil	1,988
Specialist Professional Training Program	Trains specialists in post-graduate courses in Mining, Railroads, Pelletizing Plants and Ports	Brazil	200
Recruitment Program for Projects	Provides engineers with specialist training in implementing Vale's capital projects	Global	147
Trainee Program	Trains recent graduates for leadership positions at Vale	Global	40
Inclusion Program for People with Disabilities	Trains people with disabilities to work in operational and administrative activities at Vale	Brazil	168
Total			5,609

Valer – Vale Education provides a series of external training courses to employees, in addition to the Professional Training Program. In 2011, these involved 5,609 people

GRI Reference

Indicator: SO1

Authors of
the case study:
Janaína Pinheiro
and Paula Eller



Case Study

Transforming lives through education

Vale understands that education plays a critical part in its “Improve together” core value. Shared knowledge can help transform lives. One example of the power of education is the Model School project in the Brazilian state of Pará, which aims to contribute to young people’s academic and professional development.

In the Model School Project, students follow the established curriculum, with regular lessons. Educational support is also provided for after-school activities. From the second year, these lessons are complemented with technical and vocational courses, during which students receive a study grant, a uniform and educational material, as well as having their transport and food expenses paid.

Each month, Vale meets with participating schools and students to monitor the project and see how the classes are progressing and how the students are performing. There are also extra-curricular activities, such as chats with Vale’s managers about the labor market and their careers. Students also have the opportunity to see how the company works up close, during visits to Vale facilities.

In 2011, the project benefited 160 students in Parauapebas, Canaã dos Carajás and Ourilândia do Norte, all in Brazil. By the start of 2012, this number had doubled. Through the Model School project, Vale is contributing to young people’s development and citizenship, while also guaranteeing the development of a qualified workforce that can work in its businesses or in other economic activities.

Dialogue and ombudsman

Vale is highly focused on the socioeconomic development of the communities where it operates. The company understands that to meet this commitment it must listen to these communities and establish transparent relations based on trust. Vale supports projects that maintain and construct relationships between the company and local communities. These include its recent decision to improve the methodology of its Social Dialogue initiative.

For the company, it is a priority to increase and deepen the methodology of its Social Dialogues, which use communication channels with communities, enabling them to bring their concerns and questions to Vale’s attention in an increasingly quick and easy way, which helps to mitigate possible conflicts. These mechanisms aim to improve relations between communities and the company and also to contribute to Vale’s social impact management.

A recent successful example of the work of Social Dialogues is the Reference Group in the state of Minas Gerais in Brazil. This is a committee that forms part of the Social Dialogue initiative and serves to bring together on a regular basis representatives from various company areas, so that topics raised by the community can be discussed and analyzed. As of 2012, Vale is managing its relations with communities using the Community Relations Management Tool. This enables the company to monitor the demands and concerns of communities and aims to improve its capacity for responding to communities. 

Health and safety in the community

Vale believes that healthy and safe families are essential to a healthy and safe company, and it always puts life first in the communities where it operates. Find out more about Vale’s commitment to health and safety in the People section of this report on page 29.

To promote health and encourage a culture of prevention in the communities where it is present, Vale carries out a range



It is necessary to establish and monitor an effective and positive social agenda, guaranteeing that we generate a legacy

Gleuza Jesué,
Environment Department Director

Research To study the history, culture and socioeconomic characteristics of the traditional communities that live along the banks of the Capim River in the northeast of the Brazilian state of Pará, the Vale Technology Institute is carrying out multidisciplinary research with the Emílio Goeldi Museum of Pará, in the villages of São Domingos do Capim, Ipixuna and Aurora do Pará. The research project is studying the vegetation and flora of these communities and is looking at how the local inhabitants use these plants to support themselves.

of actions to raise awareness including prevention campaigns against malaria, dengue fever and yellow fever. The Vale Foundation also has a Healthcare Program in the state of Maranhão, Brazil, which is focusing on improving mothers' and infants' health by training health professionals, educators and community leaders, through actions coordinated with local public services, civil society and higher education institutions.

In addition to prevention campaigns against HIV/AIDS and other sexually transmitted diseases, the company also carries out programs to prevent and control other sexual health risks, such as its sexual education program (Vale Youth, undertaken by the Vale Foundation) focused on sexual guidance and actions to prevent STDs.

Artisanal and small-scale mining

Vale is aware of the importance of artisanal and small-scale mining, which provides a significant source of work and income in many countries around the world. The practice is especially widespread in gold and diamond extraction activities. However, Vale has also identified incidents in other mineral extraction activities, such as copper and cobalt, either inside company operations or adjacent to them.

In 2011, evidence of artisanal and/or small-scale mining was identified near three Vale operations in Indonesia, Chile and Itabira⁷ (Minas Gerais, Brazil). When the existence of illegal extractive activities is found near Vale operations, Vale's Human Rights Guide states that the appropriate action to take is to notify the government authorities to regulate and if necessary relocate the activity. This is because illegal artisanal mining may be damaging to the economic, social and environmental development of certain locations, in addition to increasing risks to the lives of those who practice it. 

GRI Reference

Indicators: MM5, MM8
Profile: 4.16




Children during a cultural exchange between the Xikrin do Cateté indigenous people and Vale employees and their families, Ourilândia do Norte (PA), Brazil

Preservation of cultural and ethnic identity

Vale's relations with indigenous communities are based on the concept of ethno-development. The company recognizes the opportunity to respect and preserve local identities and cultures.

Vale acts to prevent, mitigate or compensate for any possible impacts on these communities. It is committed to reaching agreements with indigenous peoples and to a long-term, integrated vision of the development of the traditional communities near its operations, to help resolve any conflicts and avoid recourse to legal actions.

In 2011, Vale's actions benefited more than 10,000 people from eight different ethnic groups in Brazil alone. 

In 2011, Vale interacted with 21 traditional communities across all its businesses including its railroads, complexes and projects. Of these 21 communities, 12 are located in Brazil, two in Australia, six in Canada and one in New Caledonia. Formal agreements have been established with 15 of these groups⁸.

The company's Policy for Relations with Indigenous and Quilombola Communities is currently in the validation stage. It reflects the need to make a prior assessment of the impacts that Vale operations could have on indigenous populations, in all of the countries where it operates. The document also aims to serve

Vale aims to engage in dialogue and have positive relations with the indigenous communities that live in areas near to its operations, so that there can be common interests and transparent support for ethno-development

⁷ Vale does not calculate the percentage of units that are close to artisanal mining activities as there is no standard definition of business units.

⁸ In 2011, none of these agreements involved payment for land use.



Author of the
case study:
Cláudia Lopes

Case Study

Preserving history

At the Salobo project, in the Brazilian state of Pará, which will produce copper from the largest single discovery of this mineral in Brazil, various archaeological discoveries have been made of remains left by the peoples who lived by the Itacaiúnas River and its tributaries at least 6,000 years ago.

To preserve this heritage, an Educational Heritage Program is being implemented in partnership with the Emilio Goeldi Museum of Pará (MPEG) and the Foundation for the Development of Research (FADESP). The project, which began in 2005, aims to raise awareness of the archaeological discoveries that have been made in the Amazon region, as well as to increase and improve the content that schools teach about this subject. Another aim is to develop self-sustaining craft practices and train local craftspeople in ceramics production, inspired by the designs of the archaeological discoveries.

Residents of the Paulo Fontele village, children and teenagers from the village of Sansão and a group of craftspeople from Parauapebas participated in the workshops. Courses were also given to housewives, smallholders and teachers and students from local schools.

One result of the program was that a group of craftswomen from Parauapebas created their own association, "Clay Women," which produces bio-jewelry, decorative ceramic objects and domestic utensils inspired by the indigenous designs discovered in the region.

The program has now produced around 2,000 products and will be wound up in 2012, with the production of a book, a bilingual catalog of craft products and information about the local archaeological discoveries, the launch of the newspaper "Dialogue," and an exhibition to showcase the project and launch the products.

The community relations policy aims to formalize and guide the company's approach to traditional communities, and is already in practice in the operational area




Commitment

To understand the needs of communities, Vale aims to contribute to an improvement in their living conditions, reinforce relations and communications, minimize negative impacts of actions, respect local cultures, carry out structural actions and strengthen social investments


as a guide for professionals who work in environmental licensing processes.

Currently, Vale's positioning is included in two documents: the "Good Practice Guide — Indigenous Peoples and Mining" published by the International Council on Mining and Metals (ICMM) and an internal guide for use in engaging the mining industry and indigenous peoples.


A goal of Vale's for the coming years is to support capacity-building and institutional improvements in the communities that it supports. This will enable indigenous peoples to play a greater part in the management of resources provided by Vale. For instance, in the environmental licensing process appropriate methodologies are needed to carry out impact studies and to propose joint programs between the company and communities. In this area, in company training has already been provided and issues related to indigenous peoples have been discussed. 

Actions in 2011

Investing in training for operational areas is a strategic priority for Vale as it assumes the challenge of anticipating problems

and mitigating legal disputes with indigenous communities. 

Monitoring Lawsuits

In 2011, there were ten legal cases involving the rights of indigenous peoples in areas near to Vale operations. In all of these cases Vale is trying to assess and respect the demands of the peoples and is concerned that all parties can arrive at an understanding that will generate benefits for all involved. 

GRI Reference

Indicator: HR9



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011



20%

.....
of Vale's energy
supply comes
from renewable
sources

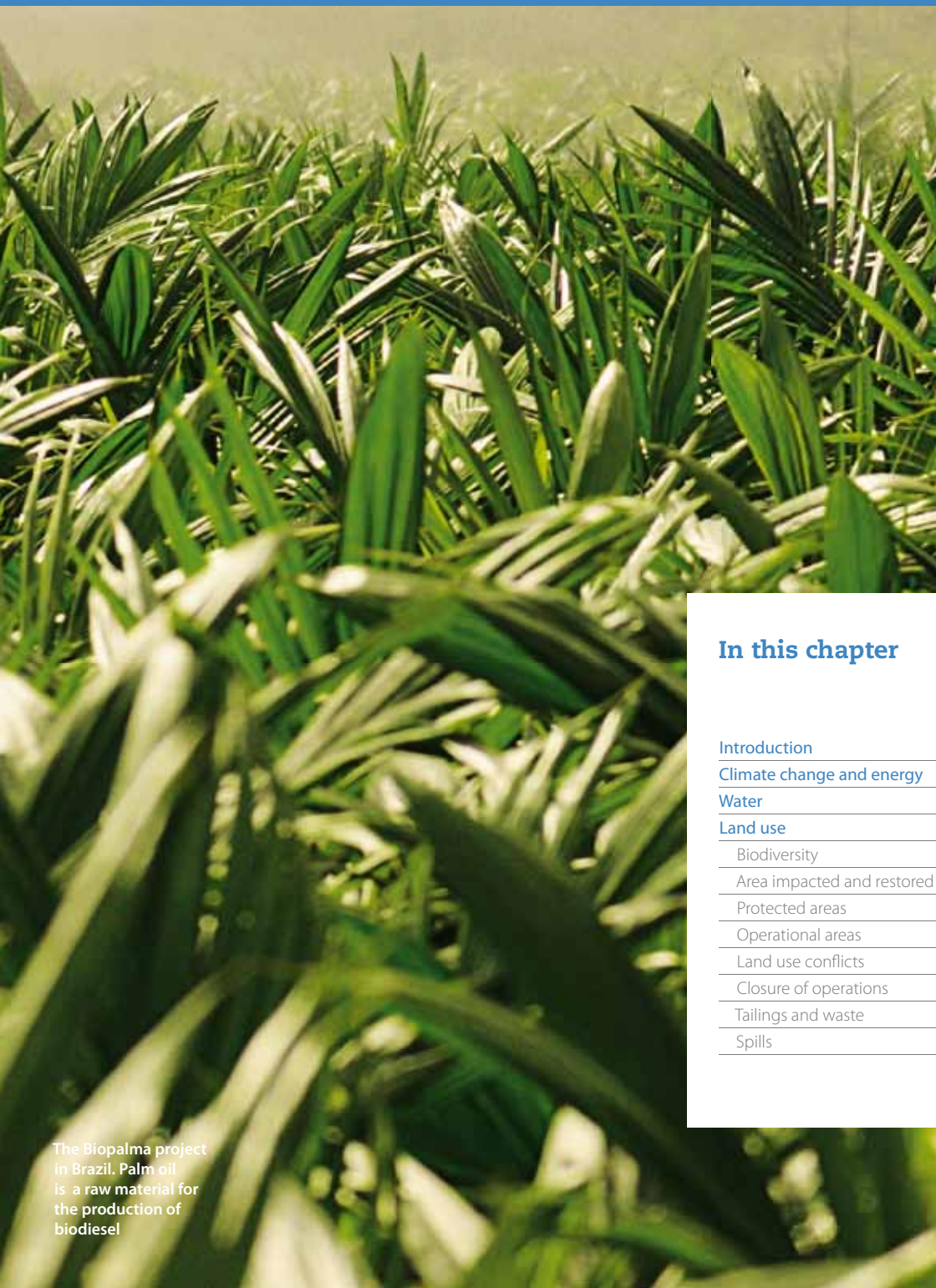


US\$ 1bn

.....
was spent by
Vale on the
environment in 2011

Planet

Practice the efficient use of natural resources



The Biopalma project in Brazil. Palm oil is a raw material for the production of biodiesel

In this chapter

[Introduction](#)

[Climate change and energy](#)

[Water](#)

[Land use](#)

[Biodiversity](#)

[Area impacted and restored](#)

[Protected areas](#)

[Operational areas](#)

[Land use conflicts](#)

[Closure of operations](#)

[Tailings and waste](#)

[Spills](#)



Planet

In the Planet chapter,
the main issues are

Climate Change and Energy, Water and Land Use



25.2 km²

is the size of the area
restored by Vale in 2011. It
is equivalent to 2.5 times the
size of Stanley Park
in Vancouver, the largest
city park in Canada

83

was the total
number of **suppliers**
trained in developing
their own GHG
emissions inventories




70%


was the **proportion of**
water reused/recycled by
Vale in 2011

Introduction

To meet its environmental commitments, Vale has a series of corporate policies and procedures

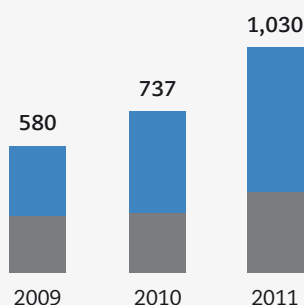
based on its Environmental Management System (EMS) — a global environmental management model that emphasizes mitigating potential environmental impacts and preventing risks associated with its operations. 

Resources spent on the environmental area

In 2011, Vale spent more than US\$1 billion on environmental control and protection, 40% up on the level in 2010. Of this total, 70% (US\$721 million) was allocated to activities in Brazil and US\$309 million went to other countries where Vale operates. Voluntary spending represented 15% of this total, with the other 85% used for costs associated with legal requirements. Most of the voluntary spending (94%) was used for environmental management. 

Environmental expenditure

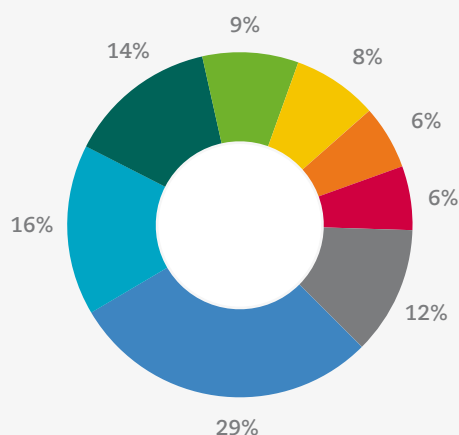
US\$ million



	2009	2010	2011
Investment	319	461	661
Costs	261	276	369
Total	580	737	1,030

Resources invested and spent by activity 2011

Total = US\$ 1,030 million



	Amount
Tailings dams, dikes and waste rock piles	298.4
Air emissions	164.9
Environmental management	143.3
Water resources	90.2
Mine closure	82.7
Restoration of degraded areas	63.7
Waste	61.5
Other	125.7

GRI Reference

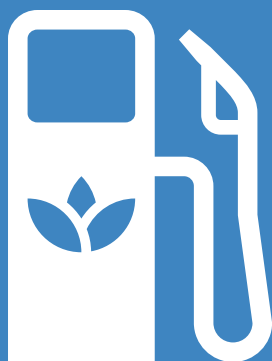
Indicator: EN30



Commitment

To reduce greenhouse gas (GHG) emissions by 5% from their forecast baseline level in 2020 and encouraging the supply chain to follow the same path

To invest in **renewable energy sources**, energy efficiency and technological innovation



Vale's target is by 2015 to reach a level of **20% of biodiesel in the biofuel mixture used in its Brazilian operations**

17%

was the increase, compared with the previous year, in the **consumption of biomass, a renewable fuel**

2005

was the year in which Vale first implemented its **GHG emissions inventory**

Climate Change and Energy

As an energy intensive company and a coal producer, Vale recognizes its impacts on climate change as well as its exposure to the risks generated by it, whether these risks are regulatory, economic (carbon taxation and higher price of energy) or physical (extreme events and higher temperatures). These risks may affect the company's businesses and competitiveness.

Vale is concerned about the destructive potential of climate change for the planet. According to the special report by the International Panel on Climate Change (IPCC) on the management of the risks of extreme events and disasters, impacts are already being seen, such as the melting of glaciers, the rise in the sea level, intense rain and major flooding. Vale realizes that these effects could affect the integrity of ecosystems and the well-being of populations.

In this context, Vale assumes the challenge of acting proactively. The company is working in the area by evaluating operational risks, minimizing vulnerabilities and maximizing opportunities — such as technological innovation to reduce consumption of fossil fuels and investment in clean energy supplies — and developing strategies for adapting to the risks of physical impacts.



An ipê-rosa tree in Carajás National Forest in Brazil, one of the areas that Vale helps to protect

In 2011, Vale invested approximately US\$10 million in energy efficiency and corporate projects in the field of climate change. In addition, in 2012 the company established a concrete emissions reduction target, in order to reinforce its commitment. The target is for Vale to cut its 2020 forecast emissions by 5%, using similar methodology to that used in the sector plans implemented in the Brazilian National Climate Change Policy. Baseline emissions are calculated using data from strategic planning at Vale in a business-as-usual scenario, reaching 33 million metric tons of CO₂ equivalent in 2020. The reference year from which the emissions are forecast is an average of 2008, 2010 and 2011. 2009 was not included because emission data were distorted by the economic crisis. The methodology used recognizes the



Challenges

Achieve an overall target to **reduce Greenhouse Gas emissions**

Invest in **clean energy supplies**



Engage the **value chain**



Invest in **research and development** for carbon capture and storage projects

GRI Reference

Indicator: EC2

reality of growing countries and companies and will allow for changes to the target if the annual strategic planning exercise at Vale results in significant changes to emission forecasts.

Coal Vale recognizes that producing and burning coal to generate energy causes significant GHG emissions. However, coal is a necessary and important energy source, and hence the company retains operations that produce and use coal. The company has mechanisms for reducing methane emissions in coal mines, and is committed to investing in carbon capture and storage research and development projects, as well as identifying alternative energy sources.

Climate change strategy

In a process that began in 2011 and was completed in 2012, Vale updated its Global Climate Change Policy. There have been significant developments in the topic since the first version was published in 2008, and also major developments in Vale's commitments and actions. The new Policy includes the commitment to establish a global target for reducing the company's emissions. The Policy reinforces the company's role in mobilizing its supply chain to combat climate change in an integrated way, among other commitments. The target was established in 2012 (more information can be found on page 65).

The Vale Carbon Program is an integral part of the company's Corporate Climate Change Guidelines. It is a set of globally coordinated actions to promote Vale's GHG emissions reduction strategy through new technologies and less carbon-intensive processes.

The Program is based on five pillars:

- Strategic evaluation of the impact of climate change on business, and capacity building across the company to operate in the new competitive environment;

Main climate change risks associated with Vale's businesses

	Regulatory risks	Physical risks	Opportunities
Revenue	<ul style="list-style-type: none"> – In 2011, various international commitments were made. In Brazil, the National Climate Change Policy was developed, which included the Mining Plan and Industry Plan. These plans may lead to changes in consumption patterns in the medium term. 	<ul style="list-style-type: none"> – Changes (positive or negative) in production volumes and origins, due to regional physical impacts of climate change. – Potential impact (positive or negative) on logistics services due to changes in production in the company's areas of influence. – Potential impact (positive or negative) of higher demand for less carbon-intensive final products, influencing the entire value chain. 	<ul style="list-style-type: none"> – Development of carbon credit projects as part of the Clean Development Mechanism, in industrial processes and forest projects. – Development of carbon credit projects as part of voluntary carbon markets, in industrial processes and forest projects. – Development of projects as part of Reducing Emissions from Deforestation and Forest Degradation (REDD).
Investment	<ul style="list-style-type: none"> – It is possible that the company will need to invest in production process adaptations. 	<ul style="list-style-type: none"> – Additional investment in adaptation (of infrastructure) in the medium and long term. – Revision of timeframes for implementing projects due to more frequent occurrence of extreme climatic events. 	<ul style="list-style-type: none"> – Production of climate change risk analyses in the development of capital projects. – Development of new businesses in renewable energy. – Research and development to generate cleaner energy for Vale. – Development of new forest businesses.
Cost	<ul style="list-style-type: none"> – Potential impacts (positive or negatives) on costs, depending on how reduction programs are instituted. – The introduction of obligatory emission targets may directly affect the company's production. – Potential imposition of customs tariffs to prevent countries without taxes from benefiting from competitive advantages. 	<ul style="list-style-type: none"> – Potential additional demand for social and environmental actions in areas of influence. – Additional cost of insurance for production facilities. – Potential impact (positive or negative) on logistics services due to regional physical impacts of climate change. 	<ul style="list-style-type: none"> – Potential financial incentives to generate cleaner energy. – Potential for discovery of resources as yet untapped due to climate characteristics impeding extraction. – Energy efficiency and GHG emission reduction projects. – Better understanding of the topic may lead to best practices, reducing the company's costs. This reality is recognized by Vale through the creation of its technology institutes, one of them focused on sustainability.

- Support for and introduction of initiatives for reducing GHG emissions and sequestering carbon dioxide;
- Cooperation and partnerships to research and develop technologies and implement mitigation and adaptation measures in the regions where Vale operates;
- Engagement with governments and the private sector to monitor and contribute to the preparation of regulatory frameworks necessary to respond to climate change;
- Transparency and continuous improvement in reporting of emissions.


Recognizing that climate change poses risks to its businesses, Vale constantly monitors the most significant risk sources, as shown in the table above.

The improvement of climate change management at Vale's businesses and the execution of mechanisms to reduce GHG emissions are the company's main strategies for aligning energy security with a low-carbon economy. In part, this approach is a response to the imminent expansion in its energy consumption that will take place as new operations come on line and existing ones are expanded.

Since 2005, Vale has been tracking its emissions profile through its GHG inventory, enabling it to create strategies and plans to follow a development model based on a low-carbon economy.

In 2011, Vale's total GHG emissions, defined as the sum of its scope 1 ¹ and scope 2 ² emissions, were 16.9 million metric tons of CO₂ equivalent ³, 15% down on 2010 values, as shown in the chart to the right.

The reduction in total absolute emissions is basically due to the sale of Vale's aluminum operations and the closure of its Carajás Pig Iron unit. Alumina and primary aluminum production represented approximately 30% of Vale's total emissions.

The main inclusions in the scope of the 2011 emissions inventory were the start-up of a new pelletizing plant in Oman, the beginning of ferronickel production in Pará (Onça Puma), Brazil, the start of phosphate production in Bayovar, Peru, and expansion of Vale's fleet of ships, used to transport its products. 

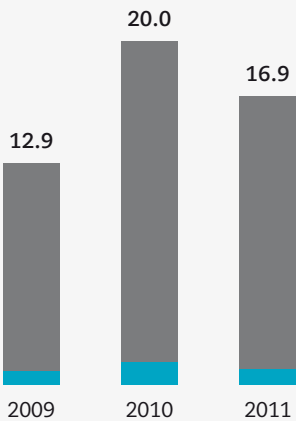
Making a comparative analysis between Vale's GHG emissions in 2011 and its recalculated emissions for the base year ⁴ of 2010 ⁵, total GHG emissions increased, due to the fact that the company achieved record output in iron ore, pellets and coal. The higher emissions were directly associated with higher consumption of fuels and inputs in industrial processes.

Approximately 62% of Vale's total emissions result from the use of fuels for energy purposes (in mining activities and internal transportation in mines, logistics services, thermal electricity generation, steam production, and heating of furnaces), 28% are generated in industrial processes,

¹ Scope 1: an organization's direct emissions, encompassing emissions from fuel use and production processes.
² Scope 2: an organization's indirect emissions, encompassing emissions from the purchase of electricity and steam used in the production process.
³ CO₂ equivalent: unit for measuring greenhouse gas emissions, converting all types of GHG based on their potential contribution to global warming.
⁴ The base year is the reference year for a consistent comparison of GHG emissions over time, reflecting significant structural or methodological changes, such as, for example, acquisitions, mergers and divestments.
⁵ Excluding emissions from discontinued operations and including new investments and sources of emissions.

Greenhouse gas emissions

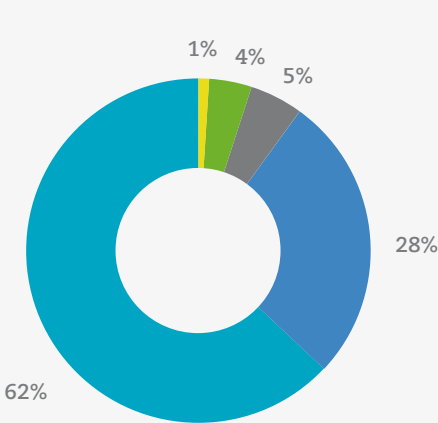
Scope 1 and 2 — million metric tons of CO₂e



	2009	2010	2011
Scope 1	12.1	18.7	16
Scope 2	0.8	1.3	0.9
Total	12.9	20.0	16.9

Emissions by source 2011 ¹

Total: 16.9 million metric tons of CO₂e



- Consumption of fuel
- Production
- Consumption of electricity
- Coal mining
- Use of phosphate rock

Production	28%
Production of iron ore pellets	13%
Nickel and co-products	4%
Ferroalloys	5%
Ammonia and urea	4%
Nitric acid	2%
Pig iron	1%

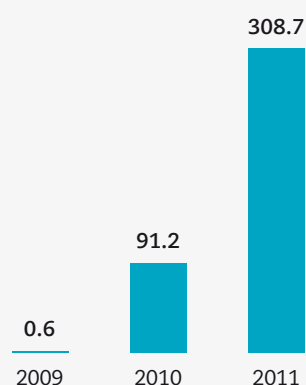
¹ HFC emissions are related to the use of explosives in mining and were not considered significant.

GRI Reference

Indicators: EN16, EN17, EN29

Indirect GHG emissions^{II}

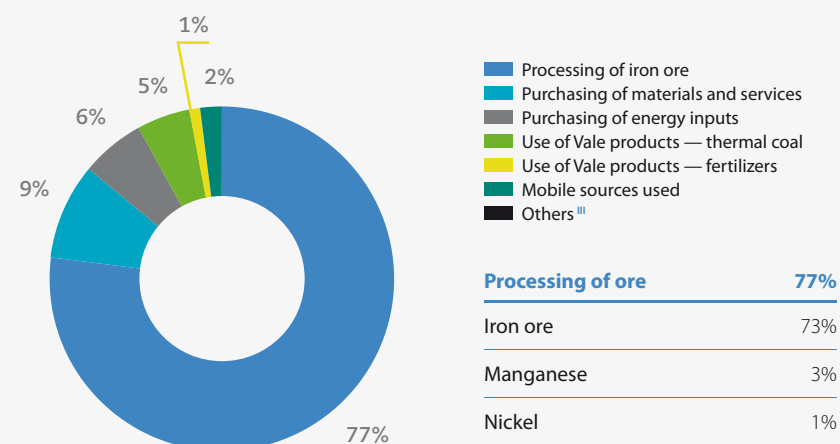
Scope 3 — million metric tons of CO₂e



^{II} The increases reflect the consecutive extensions to the scope of the inventory of other indirect emissions, covering Vale's value chain.

Sources of indirect GHG emissions in 2011

Scope 3 — Total: 308.7 million metric tons of CO₂e




Processing of ore

Iron ore	73%
Manganese	3%
Nickel	1%

^{III} There were no significant emissions from the "Others" item, which refers to the categories of acquisitions of capital goods, processing cobalt and copper, business travel, losses from the electricity network and mobile sources used.

4% are fugitive emissions, and the remaining 5% result from the purchase of electricity and steam.

Of the 28% of Vale's emissions resulting from industrial processes, pellet and nickel production stand out. The chart on page 68 shows a breakdown of the company's total emissions (scopes 1 and 2) by type of source.

The company's activities consume a large quantity of renewable electric power, as the majority of its operations are located in Brazil, where approximately 85% of electricity is produced from renewable sources. This is reflected in low indirect emissions (scope 2). 

In line with the fourth pillar of the Carbon Program, for the second consecutive year Vale expanded its inventory of other indirect emissions (scope 3), which includes its supply chain, as shown in the chart on this page.

With the publication of the final version of the document Corporate Supply Chain (Scope 3) Accounting and Reporting Standard, new scope 3 categories were included in Vale's inventory and the scope of existing categories was considerably expanded. The most important categories in Vale's supply chain are:

I the processing of products, in this case iron ore and manganese in the steel industry;

II the purchase of materials and services, in this case the purchase of process inputs; and;

III the purchase of energy inputs related to the use of fuels.

In addition to emissions management, the company's strategy also includes raising awareness and engagement in its value chain, focusing on its suppliers. Building on its work in 2010 to diagnose GHG emission management, in 2011 Vale trained 83 Latin American suppliers, enabling them to produce their own high-quality, secure and robust GHG emission inventories (see more in the case study on page 72).



Our rail operations are major consumers of fuel, and we need to invest in technology and in the diversification of our energy supplies

Humberto Freitas,
Executive Officer of Logistics
and Mineral Exploration

In 2012, a new initiative is planned to track the evolution of each supplier and share best practices. It is expected that this initiative will allow Vale to expand and improve the quality of its indirect emissions management.

The company continues to support the joint mobilization of sector organizations, governments and companies in the pursuit of solutions to climate change. In 2011, Vale participated in the development of the Brazilian mining sector's plan to reduce GHG emissions, together with the Ministry of Mines and Energy and the Brazilian Mining Institute (Ibram), among other groups.

It also participated in business working groups run by institutions such as the Brazilian Business Council for Sustainable Development (CEBDS), the Ethos Institute, the Getulio Vargas Foundation, and the International Council on Mining and Metals (ICMM), to produce [studies and research, including a study on adapting to climate change conducted by the CEBDS' Energy and Climate Thematic Group.](#)

On the path to a low-carbon economy

Vale is contributing to the promotion of sustainable development, and seeking to participate in a low-carbon economy by structuring projects to reduce GHG emissions and capture CO₂ in its operations. In this area, important projects were developed in 2011. More information can be found in the "S11D and Carnalita: [innovation and technology](#)" case study, on [page 76](#), and other initiatives included in the online report.

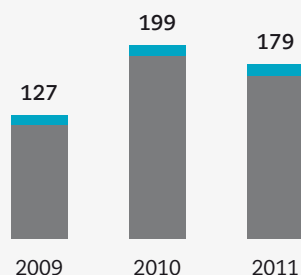
The Action Plan on Sustainability (PAS) also establishes annual targets for the specific reduction of fuel and electricity consumption. Both of these reductions contribute to reducing Vale's GHG emissions from the burning of fuel and from certain sources of electricity. More information about the PAS can be found on page 16.

GRI Reference

Indicators: EN3, EN4, EN18

Total direct energy consumption

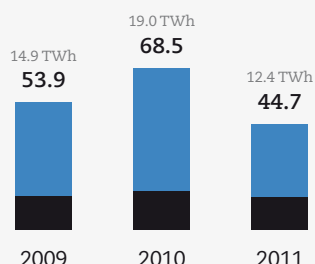
Thousand TJ/year



	2009	2010	2011
Renewable	11	12	13
Non renewable	116	186	166
Total	127	199	179

Total indirect energy consumption

Thousand TJ/year



	2009	2010	2011
Renewable	40	52.2	31
Non renewable	13.9	16.3	13.7
Total	53.9	68.5	44.7

Energy management

As described on page 68, 62% of Vale's total emissions results from the use of fuels for energy purposes. Although there was a decline in consumption in 2011, management of this resource is becoming increasingly necessary as the company expects its demand for energy to rise in the coming years.

For this reason, the company is working to ensure reliable energy supplies at a competitive cost, making projects feasible while conserving the resources and respecting the energy policies in the countries where it operates.

Vale's strategy is to invest in its own generation facilities, seeking specific energy solutions for each operation, including the adjustment and reinforcement of infrastructure in each region. This initiative generates benefits for both Vale and its locations, guaranteeing expansion in energy generation capacity and promoting economic and social development in the regions where the company operates.

Guaranteeing the supply of energy to its operations is one of Vale's main strategies for business continuity

Energy consumption

Due to the ending of some electric power-intensive activities such as aluminum production, Vale's direct energy consumption in 2011 (fuel supplies) was approximately 10% lower than in 2010, amounting to 179,000 TJ, as shown in the chart above.

However, on a comparative basis using a base year (excluding the effect of the sale of the aluminum business), fuel consumption increased. For example, thermal coal consumption increased by 53% following the start of operations at the pelletizing plant in Oman and the start of ferronickel production at Onça Puma. In addition, natural gas consumption increased by 30%, also because of the start of operations in Oman and the increased use of gas at the nickel refinery in Japan.

Approximately 8% of total direct energy consumed was accounted for by renewable sources. Among renewable fuels, there was a 17% increase in biomass use and a 13% rise in pure biodiesel (B100) use, while consumption of B10 diesel rose six-fold from 2010 due to higher demand at El Hatillo coal mine, in Colombia.



Authors of
the case study:
Vivian Mac Knight,
Cristina Matos,
Miranda Braga and
Laura Albuquerque

Case Study

Encouraging reductions in GHG emissions

As part of its commitment to reduce its impact on climate change and to create long-term value, Vale has implemented the “Greenhouse Gas (GHG) Emissions Management in the Value Chain” program, which aims to involve suppliers in these efforts.

Under the program, Vale is encouraging its suppliers to build their own capacity to establish an emissions inventory at their companies. The initiative aims to help them to find new ways of improving their emissions management, to carry out mitigating actions and improve any actions that they already undertake.

In 2011, the year in which the project began, 138 strategic suppliers in Latin America were invited to participate in the training and training was provided to 83 of these suppliers. In 2012, suppliers from other continents will be invited to join the program.

The action is linked to the Vale Carbon Program, part of the company’s Corporate Guidelines on Climate Change and Carbon and which includes different actions to help global climate change mitigation.

Indirect energy consumption (purchase of electricity and steam) in 2011 was 12.4 TWh, around 35% down on 2010, once more influenced by the sale of the aluminum and alumina businesses.

Innovations in energy efficiency

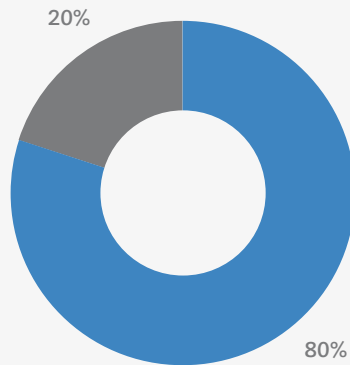
In order to find a balance between energy security and climate change, some important initiatives are under way at Vale. These include the mapping and implementation of opportunities to reduce energy consumption, both at existing operations and in capital projects; the development of energy consumption information tools; the revision and production of technical documents focused on rational energy use; and training for technical energy efficiency groups at operations.

Guaranteeing operations’ energy supplies is one of the main strategies for the continuity of Vale’s businesses. As a result, the company is investing in its own generation, efficiency and diversification of energy sources, with the aim of expanding the share of demand supplied by renewable sources and thereby cutting GHG emissions.

For example, in Clydach in the United Kingdom, a project is underway to use domestic waste to generate approximately 10 MW of electricity through pyrolysis (the decomposition of waste at high temperatures).

Consolidated energy sources

Total = 224 thousand TJ (2011)



Renewable	20%
Acquired electricity — renewable ^I	14%
Hydroelectric	4%
Biomass	1%
Biodiesel (B100) and ethanol	1%
Non-renewable	80%
Diesel	22%
Natural gas	16%
Fuel oil	12%
Mineral coal	9%
Shipping fuels ^{II}	6%
Acquired electricity — others ^{III}	6%
Others ^{IV}	9%

^I Hydroelectric and biomass.

^{II} IFO and MGO.

^{III} Nuclear and thermal.

^{IV} Kerosene, LPG/Propane, Gasoline, Coke, CO rich gas, Residual Oil, Methanol, Jet Fuel, Off gas, light refinery hydrocarbons and Charcoal.

In its actions Vale aims to reach a balance between the need for energy security and the mitigation of the effects of climate change

improving efficiency, reducing costs and minimizing GHG emissions. As shown in the Consolidated energy sources chart above, 20% of Vale's direct and indirect energy supplies come from renewable sources. The company aims to extend its use of clean energy sources such as hydroelectricity, wind, biomass, solar, and biofuels. The company is currently evaluating projects in these areas.

In 2011, four of Estreito Hydroelectric Plant's eight generating units started operating in the state of Maranhão in Brazil, with installed capacity of 1,087 MW, meeting some of Vale's power demand in the North of the country. Vale has a 30% stake in the consortium administering the project. In July 2011 in Indonesia, the Karebbe hydroelectric plant, with installed capacity of 130 MW also began operating to supply part of the demand from Vale's nickel operations in the country.

Although the plant's average demand is expected to rise from 4.5 MW to 5.3 MW, it will generate surplus power, to be sold on the local market. It is expected that the project will be completed in 2012.

Diversification of energy supplies

Vale has invested in energy generation technology research, development and innovation, focusing on

Another share of Vale's power demand will be met as of the first half of 2015,

GRI Reference

Indicator: EN7



A palm tree plantation for the production of biodiesel in Brazil

Biodiesel

Investing in renewable fuels

One of the first companies to use biodiesel in its operations, Vale is initially investing US\$633 million to produce biofuel and expand its use in its machinery and logistics systems. In 2011, Vale acquired control of Biopalma da Amazônia S.A, a company with which it had formed a consortium the previous year to produce the main raw material used to make biodiesel, palm oil.

Vale's decision to invest in biodiesel production is part of its strategy to diversify its energy sources and be a global sustainability agent. From an environmental point of view, this project will permit a reduction in greenhouse gas emissions while restoring impacted areas.

Through this transaction, Vale ended up with a 70% interest in the company, which will be responsible for planting 80,000 hectares of palm trees in the Moju, Tomé-Açu, Abaetetuba, Acará and Concórdia regions in the state of Pará, including 20,000 hectares of family-run farms, with 2,000 families expected to be participating by 2013.

In 2011, the total planted area stood at 35,000 hectares, and the goal is to reach 60,000 hectares of plantations by the end of 2012 and 80,000 hectares in 2013. These activities are taking place in important parts of the Amazon biome, which were previously used for pasture before being abandoned.

As well as recovering these areas by planting palm trees, more than 70,000 hectares will be allocated for legally required native forest cover and permanent preservation areas.

The company's investment in the sustainable production of palm oil and biodiesel has already received international recognition. At the start of 2012, Vale was awarded the Sustainable Biofuels award by World Biofuels Markets.

when the Belo Monte Hydroelectric Plant will begin operating in the state of Pará in Brazil.

Why does the Belo Monte Hydroelectric Power Plant make sense to Vale?

Vale's growth strategy calls for investments in power generation projects, such as participating in the Belo Monte Hydroelectric Power Plant. Vale is aware that the project has caused adverse reactions with regard to its social and environmental impacts, and the well-being of the indigenous communities in the region during the construction and operational stages. Vale believes that the project will leave a positive legacy for the region. Vale is acting proactively, based on best practices, particularly concerning issues related to sustainability.

According to the Brazilian government's Ten-Year Energy Expansion Plan (PDEE-EPE), the country's demand for electricity is expected to grow at an average rate of 4.7% per year over the next decade, from the current level of 59 GW to 88 GW in 2020.

The Brazilian power grid is largely supplied by hydroelectric dams (80%), complemented by thermal plants, wind power and biomass. Out of all the available energy sources for generating electricity,



The great opportunity for Vale is to invest in energy, in projects in renewable energy, energy efficiency and technological innovation

João Coral,
Global Director of Energy

Vale is contributing its experience in major projects to the Belo Monte hydroelectric plant

hydroelectric power offers the most favorable conditions for meeting the socioeconomic growth forecast for the coming years, in terms of cost (economic competitiveness), environmental feasibility, low greenhouse gas emissions, and supply reliability.

Vale's investment in electricity generating assets, such as its acquisition of a stake in the Belo Monte hydroelectric power plant, is consistent with its status as a major electric power consumer and its growth strategy. It also reflects Vale's commitment to contribute to the development of the countries where it is present, and supports Brazil's commitment to reduce greenhouse gas emissions.

Building the Belo Monte Hydroelectric Power Plant will add an average of 4,571 MW of power to Brazil's grid, enough energy to supply 40% of the country's entire

residential demand. It is therefore a fundamental project for the national energy expansion policy, playing a major role in making electricity available to Brazilian society in the coming years while satisfying the requirement for low tariffs and energy security.

Controversy surrounding the project

Vale recognizes that its decision to invest in hydroelectric power plants has provoked adverse reactions with regard to its impacts on the region. Before joining the project, the company made a thorough analysis of its Environmental Impact Assessment (EIA) and Report and Basic Environmental Plan to be sure that Belo Monte is a sustainable project in all aspects.

The set of impacts gave rise to a wide-ranging Environmental Management Program, divided into plans, programs and projects, derived from expert opinions and license conditions, with the following objectives:

- Compliance with the expectations of shareholders, employees, the local community and society as a whole, in the sense of minimizing the impacts associated with implementing the project, keeping these stakeholders continuously informed, with the proper transparency, of the results achieved regarding the treatment of these impacts;

Sustainable projects

S11D and Carnalita: innovation and technology

Vale's application of innovation and technology to mineral production at two new projects, Carajás Iron S11D, in the Brazilian state of Pará, and Carnalita, in Sergipe, another Brazilian state, reflects the company's passion for people and the planet.

The S11D Project, which will increase iron production at Carajás by up to 90 million metric tons per year, has been designed from the start with a focus on conserving biodiversity and preserving the social structures of the local communities located where the project takes place. The project will relocate a processing plant and waste rock to an area that has already been impacted by human activity and that lies outside the Carajás National Forest where the mineral resources are located.

The initiative will enable a completely dry process for processing the mineral, leading to a 93% reduction in water consumption when compared with conventional processes. In addition, 86% of the water used will be reused. Mining operations will not feature trucks, but rather a "truckless" system using in-pit crushing and conveying technology. The replacement of trucks by conveyor belts will lead to a significant reduction in diesel consumption and emissions of particulate matter and will reduce the generation of waste such as tires, filters, lubricants and other items. This system will reduce GHG emissions by around 118,000 metric tons of carbon dioxide equivalent per year.

The Carnalita project for the production of potassium chlorate, located in Sergipe, is expected to produce 1.2 million metric tons per year of potassium chlorate, with operations due to begin in 2016.

The project will be constructed in an area of numerous sugar cane plantations and so will have no impact on native vegetation and will not require any families to be resettled. It will also be self-sufficient in electricity generation and will use sea water so that it will not need to withdraw fresh water from the local aquifer.

- Sustainable development and the use of renewable natural resources in the region where the Belo Monte project is being built, paying continuous attention to the identified maximum capacity of these resources in the light of new demands created directly or indirectly by the project;
- Protection of human health, cultural heritage and biodiversity, the latter including endangered species and sensitive ecosystems;
- Respect for the lifestyles and non-material heritage of local people, especially those who live in the project's directly affected area and area of direct influence, and with special emphasis on traditional and indigenous communities;
- Strengthening of the project's public image and reputation as a result of proactive action to achieve continuous improvement in the quality of environmental attributes of the ecosystems in the region, and in the social attributes of those involved in implementing the project and those affected.

What Vale adds to the project

Since 1995, Vale has invested more than US\$1.3 billion in electricity generation in Brazil. The company now has nine hydroelectric power plants and four small hydroelectric power facilities in operation to meet its demand for electric power in Brazil. Vale is also developing a number of wind farms and biomass projects.

In the last six years, Vale has invested more than US\$80 billion in projects in its different business areas, developing a modern governance and capital project implementation management system.

By deciding to use its experience, especially that of building and operating 21 hydroelectric power plants across the world, Vale's aims to contribute to the successful execution of the project, guaranteeing the returns that society, shareholders and partners expect from such an investment.



The hydroelectric plant of Karebbe, in Indonesia, which supplies energy for Vale's operations in the country

Vale recognizes its major role in actively searching to increase the use of cleaner sources of energy

Energy production by Vale

With regard to direct energy consumed by Vale in 2011, approximately 7 TWh were generated by Vale's own hydroelectric plants (in Brazil, Canada and Indonesia) and thermal plants located in isolated units.

Vale generated 49% of its power needs in Brazil, 96% of which came from hydroelectric plants.

Although the company is already a significant user of renewable sources, it recognizes its fundamental role in actively pursuing greater use of clean energy sources. Accordingly, Vale is working to replace diesel with biodiesel in its operations. In Brazil, the target is to raise the share of biodiesel used in biofuel blends from around 5% now to 20% in 2015. Vale has a 70% stake in Biopalma (see the case study on page 74), a company in Pará, Brazil that processes palm oil used to produce biodiesel.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011



Commitment

To use water resources in a sustainable manner, guaranteeing their conservation, protection and quality



The flow monitoring plan **identifies opportunities to optimize water use** and to improve systems that use and measure water

1.5x

Vale **saves 953 billion liters of water per year**, equivalent to around 1.5 times the annual consumption of the city of Rio de Janeiro, by reusing water in its processes



The Water Resources Sub-committee **exchanges information about water use and best practices**

Water resources are extremely important inputs to Vale's processes.

The company also recognizes water's importance to community subsistence. Accordingly, Vale seeks to optimize water use by reducing operational demand, reusing water, and minimizing the generation of effluents. In addition, the company aims to understand and anticipate potential water use conflicts through forecasts, technological development, and engagement and awareness raising with key stakeholders.

The heaviest usages of water in Vale's operations ¹ are in the dewatering activities for mining operations in saturated areas ²; in plants, where the water is used to treat the minerals and for cooling; and in the cleaning and spraying of access roads and stockyards of raw materials and products. Water is also used in pelletizing processes, ore transportation, and the washing of equipment and components.

Guidelines

Vale recognizes the need to create tools to promote effective water management and, in 2011, it formulated its Water Resources Instruction, which are currently in the approval phase. The company has established principles and guidelines on the subject, and has defined responsibilities and the main tools and structures required to properly manage water resources, in line with international regulations and technical references.



Thickening iron ore in the processing plant in Carajás in Brazil

Besides the Instruction, the company has a further 15 specific documents designed to provide orientation, applicable to operational units.

The aforementioned Instruction were the result of joint work by Vale's Environmental Leadership Committee (known by Portuguese acronym CLA) and Water Resources Sub-Committee. The CLA is composed of representative leaders of company departments (corporate and operational) who meet periodically to discuss relevant, high-priority environmental issues.

Created in 2011, the sub-committee is composed of representatives of various company business areas who are responsible for the topic of water in their respective areas. Reporting to the CLA and holding meetings every two months, the sub-committee is a forum for the exchange of information on water use and best practices, assisting the development of corporate guidelines.

In 2011, Vale invested approximately US\$90 million in water resource management, which represents around 9% of its total environmental investment, including technological

¹ All operations are licensed and have a water withdrawal permit.

² Hydrological zones in which all interstices (narrow spaces) between geological material particles or all cracks, fractures or dissolution channels in a unit of consolidated rock are filled with water at pressure greater than the atmospheric pressure.



Challenges

Guarantee harmonious coexistence with other stakeholders in water use



Reduce demand for new water at the operations, using new or current technologies

innovation initiatives, diagnostic projects and equipment. Since 2011, Vale has had a corporate management area dedicated to the theme, which is active at all Vale units, developing guidelines and conducting technology studies to improve processes and practices.

Engagement and environmental education

Vale seeks to work actively in discussion forums about water resource management and the establishment of practices together with the community. In Brazil, where concern for the topic is demonstrated in the National Water Resource Policy, the company participates in discussion groups related to organizations such as the National Water Resource Council's Technical Chambers and the River Watersheds Committees for the Paraopeba, Velhas, Doce, Piranga, Piracicaba and Santo Antônio rivers, all located in areas where Vale has operations. These committees hold dialogues and seek to identify risks associated with competition for water use and availability. Notable results of Vale's work in this area include

its participation in the creation of the National Water Resource Policy and the Minas Gerais State Water Resource Policy.

Research The Vale Technology Institute, in partnership with the Federal University of Minas Gerais, is undertaking a project to optimize water quality monitoring in the São Francisco River watershed. Using statistical methods, this research aims to assess trends in water quality parameters and to propose a methodology for collecting and analyzing water quality data.

Vale also runs education initiatives for both internal and external stakeholders to raise awareness and promote better use of water resources. One example is Environmental Attitude, a program that aims to promote sustainability principles through educational actions designed for the internal public (employees and contractors), as well as communities and schools close to the company's operations. One of Environmental Attitude's main themes is water.

Water use monitoring

During the project development stage, water availability studies are performed, taking into consideration other users, in order to contribute and guarantee conservation of water resources. In 2011, Vale's Water Resource area revised the water usage controls and flow monitoring plan for operational units³ that are heavy water users and/or located in water-stressed regions.⁴

This plan also aimed to identify opportunities to optimize water use and reassess flow measuring points in order to verify the need to make technical adjustments, replace equipment and install new meters at strategic points.

GRI Reference

Indicators: EN9

³ Presents better details and more reliability of the reported information.

⁴ High demand in relation to the production capacity of water sources may generate a scenario of competition for water use.



Authors of the case study: Fernanda Carneiro Neves and Leno Brabo

Case Study

Reusing water

Vale is constructing new industrial facilities in Carajás, including the Additional 40 Mtpa Project which will intensify production in the company's so-called North System in Brazil, which includes the units of Carajás, the Carajás Railroad and the Port of São Luís.

These construction works are applying sustainable practices to the use of natural resources, such as water reuse and recycling.

In particular, the company is reusing the water that it uses for producing concrete and for washing its concrete mixer trucks, which are water-intensive activities.

The water that is used to wash the trucks is full of sediments and flows into a decantation tank where the recycling process begins divided into six sections. When the clean water leaves the tank, it is then used in the production of the concrete that is required to construct new facilities at the site, and then to wash the trucks again. Hence, 100% of the water used to clean the trucks is reused. Vale invested US\$24,000 in the system, which involves ramps, tanks, pumps, piping and storage tanks made from fiber.

20,000 liters of water are required to produce 100 cubic meters of concrete. By the end of the project in 2013, 96,000 cubic meters of concrete will have been produced, which will require 19.2 million liters of water. Vale estimates that it will reuse 8.4 million liters of water during the construction process, i.e. 44% of the total water required. In 2011 alone, some 3.2 million cubic meters of water were saved thanks to the reuse of water in the concrete production process.

As a result of this diagnosis, the corporate area has produced projects to establish assumptions and concepts that may be developed by operational areas, tailored to the needs of each unit. Based on this survey, Vale has produced projects to install and adjust flow meters in the units of Carajás, São Luís and Vitória. In 2012, there are plans to do the same work for units in Itabirito, Paraopeba and Manganês do Azul in Brazil.

In São Luís, water meters have been installed at around 90% of the main water consumption and monitoring points in the Central Plant area. This investment enabled a detailed analysis of water collection and consumption. In addition, the unit of São Luís now has a continuous monitoring system, enabling improvements in the water management of large consuming areas. This ensures rational use without wastage and the achievement of targets for fresh water use indicators.

Through better understanding of the quantity of water used and reused, it has also become possible for 16 operational areas to adopt water consumption reduction targets, and for nine areas to adopt targets to expand water recirculation. These targets were included in the 2011 Action Plan on Sustainability (PAS). Read more about the PAS in the Strategic Vision section on page 16.

Optimizing water use

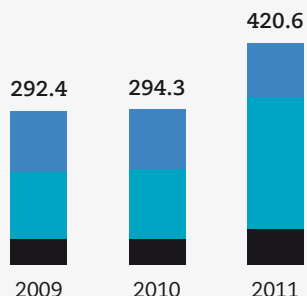
Regarding the projects that identify opportunities to optimize water use, six operations in Brazil and one in Peru were studied in 2011. As a result of this initiative, which began in 2010, plans were developed for 12 operational units in different business areas (iron mining and processing, pelletizing and ports, manganese mining and processing, and fertilizer mining and processing). These plans cover the company's most critical and representative operations, including locations with low water availability such as Peru, for example. The projects will generate estimated water savings of 7.3 million cubic meters per year (1.7% of all water withdrawn by Vale in 2011) and will require an estimated investment of US\$5.8 million.

Withdrawal, reuse and discharge

The change in reporting scope (following the sale of aluminum assets and the incorporation of units not previously reported, such as Vale Fertilizantes) had a significant impact on the water use indicators for 2011. Considering the common scope for the reports of 2010 and 2011 (without aluminum assets and incorporated units in the indicator), there was an increase in the total water demand of 5%, while generation of effluents expanded by 16%. This variation is due to a rise in production at the majority of operational units and greater reporting coverage of some areas that have improved their monitoring processes. Part of the increase in water demand was supplied by reused water.

Total water withdrawn by source

Billion liters/year

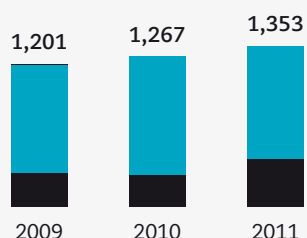


	2009	2010	2011
Ground source	115.2	112.3	101.0
Surface source	128.7	132.2	251.1
Others¹	48.5	49.8	68.6
Total	292.4	294.3	420.6

¹ Captured rain water, piped water supplied by water companies and water from other organizations. Water from surface or underground surfaces withdrawn exclusively for use by third parties is also included in this category.

Total volume of water recycled and or reused + withdrawn water¹

Billion liters/year



	2009	2010	2011
Recycled and/or reused water	913 (76%)	998 (79%)	953 (70%)
Withdrawn water	288 (24%)	269 (21%)	400 (30%)
Total	1,201	1,267	1,353

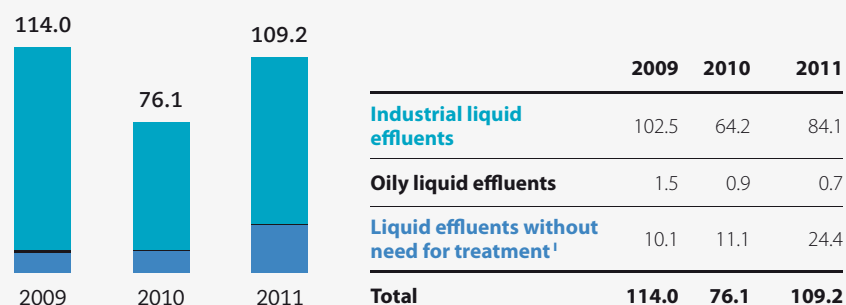
¹ To calculate the percentage of recycled and/or reused water for this indicator, the total volume of water withdrawn does not include collection for third party use. Hence the value is different from the value presented in the graph that records total water withdrawn per type of withdrawal.

GRI Reference

Indicators: EN8, EN10
EN21, EN25

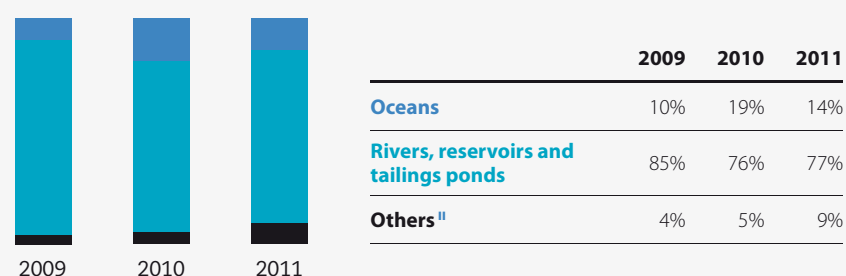
Total volume of liquid effluents generated by type

Billion liters



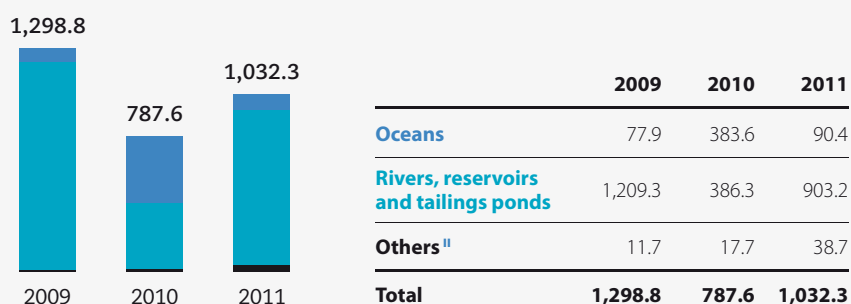
Total discharge of liquid effluents generated by destination

%



Total discharge of total suspended solids generated by destination

Thousand kg



^I "Liquid effluents without need for treatment" refers to water used in cooling and other processes whose qualitative characteristics are not altered to the extent that it requires treatment before disposal. Data on effluents generated by PT Vale Indonesia Tbk and

Thompson in Canada, part of Vale's nickel business area, were not reported in 2011, as a need to alter the data collection methodology used by these units was identified.

^{II} Lakes, lagoons, wetlands, disposal in the ground and disposal to third parties.

In 2011, analyzing the full scope, Vale reused 70% of the water it consumed in its production processes. As a result of this saving, Vale did not need to withdraw 953 billion liters of water from natural sources.

The greatest contributor to the fall in the company's water reuse percentage was the sale of the aluminum units, which had a reuse rate of 92.3%. This accounted for a seven-percentage-point decline out of a total decline of nine percentage points (from 79% to 70%).

Regarding the generation of effluents, it should be noted that the incorporation into the 2011 reporting scope of new business areas (Vale Fertilizantes) and operations (Vale Colombia, Port of San Nicolás, Transbarga Navegacion, the Vargem Grande plant, Taiwan Nickel Refining, Vale Japan, and Bayovar), which have different characteristics of generation, played a major part in the increase in the total volume of effluents generated, especially in the increase in effluents that did not require treatment.

This increase in the volume of effluents also resulted in an increase in the total suspended solids load.

Despite the increase in total volume, most effluents are treated in comprehensive physical and chemical systems that improve their quality before discharge, reducing any impacts on the bodies of water that receive them.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011



Commitment

To exercise integrated land management, seeking to reduce deforestation, generate a net positive impact¹, and share value with the regions where it operates

.....



3.5x

is how much larger than its total operational area is **the land that Vale protects or helps to protect**



73%

was the proportion of **waste recycled** in 2011. The target was 70%

US\$ 64_{mn}

was the amount that Vale invested in **restoring degraded areas** in 2011, 6% of its total environmental spending

Land use

One of Vale's main challenges is to seek integrated management of the regions where it operates and to work jointly on different aspects, such as biodiversity management, mine closure, and management of wastes and tailings. The focus is on supporting these regions and involving different local stakeholders in the theme.

The company operates in parts of the world where there are significant reserves of natural forests. Although vegetation removal is part of mining activities in many cases, the company recognizes the need to work continuously to minimize impacts. Vale compensates for this removal via legally instituted or voluntary mechanisms and by acting proactively as an agent for the conservation of biodiversity, and not only in the regions where it operates. This is reflected in the fact that Vale protects or helps to protect an area that is 3.5 times larger than the area occupied by its operations, which are often located in areas that have already been impacted by human activity or are used for industrial purposes (see more on page 88).

Vale understands that this is a challenging, long-term commitment. As a result, it is focusing its efforts to enhance engagement with relevant stakeholders, such as governments, specialist institutions and communities, seeking to influence regional government alignment through sustainability targets. Vale



A hyacinth macaw in Carajás National Forest, Brazil, one of the areas that Vale helps to protect

believes that this will not only enhance its local presence, but also benefit its relationships with various players, reinforcing trust among communities.

With regard to engagement with stakeholders, the Vale Fund operates in partnership with public institutions and third sector organizations to promote sustainable regional development.


The projects supported by the Vale Fund have helped to reduce deforestation in the Amazon through actions such as strategic monitoring of the biome, assistance for the development of sustainable municipal economies ("green municipalities") and support for the conservation of protected areas and biodiversity. These projects contributed to a 40%

¹ When the results of actions conducted by the company outweigh the negative effects of their operations.



Vale is a Brazilian company with a global presence. Our guidelines for sustainable development strive to share the value created by our activities with the communities where we operate, with the countries where we are present and with all of society

José Carlos Martins,
Executive Officer of Ferrous and Strategy

reduction in the deforestation rate in the Brazilian state of Pará between 2009 and 2011. The area of forest saved by this reduction during this period was 1,000 km² in size. For more information about the Vale Fund, [see the online report or visit www.fundovale.org](http://www.fundovale.org). 

Biodiversity

Vale recognizes that biodiversity and ecosystem services play a fundamental role in the equilibrium of the planet. Respecting them is a company obligation.


Conserving and using biodiversity and ecosystem services sustainably is essential to Vale's business continuity, as various processes depend on products and/or services supplied by these, such as water and energy. They are also essential to the quality of life of the communities that live near operations. Consequently, the company aims to set the benchmark in the mining sector for the management and sustainable use of the resources of the regions where it operates.

To achieve this goal, Vale invests in technological innovation, establishes

control systems, and takes action to prevent and minimize regional impacts. It also seeks to engage its internal and external stakeholders in these efforts and develop partnerships with them.

Impacts

Vale's operations have impacts on the regions where they are based, resulting in changes to biodiversity and ecosystem services. These impacts are intrinsic to the type of activity performed by the company, and are mainly related to changes in physical environmental components, which support living beings. These impacts alter the quality of the environment, and may affect local biodiversity, especially indirectly.

Significant direct impacts on biodiversity are especially related to removal of vegetation, which may be necessary in the project implementation phase and/or [during operational activities \(such as expanding areas to be mined\)](#). 

Area impacted and restored

Including the operations for which Vale is responsible, the total area

GRI Reference

Indicators: EN12, EN13, EN14

affected by the company in 2011 was 17.2 km². During the year, restoration activities were started in a total area of 25.2 km². These activities involved both permanent restoration (29% of the total area) and temporary restoration (71%).

Unlike in 2009 and 2010, the total area undergoing permanent or temporary restoration in 2011 was larger than the total area impacted during the year. In 2011, Vale invested US\$64 million in the restoration of degraded areas, representing 6% of the company's total environmental spending. 

Opening and closing balance

In 2011, counting only mineral extraction and production activities, 15.1 km² of land were impacted on the other hand, permanent restoration activities were started on 7.3 km², resulting in a final balance of 592.6 km².

The opening balance in 2011 was lower than the final balance of the previous year due to the sale of assets related to aluminum operations, corresponding to 157.1 km² of areas to be restored by Vale.

Significant impacts on biodiversity arising from Vale's operations

Environmental aspect	Potential impacts
Natural resources Removal of vegetation	– Impact on flora and fauna Loss of specimens and habitat loss and/or reduction
Geomorphology Movement of surface and subsurface soil Generation of mined areas, formation of waste rock piles, formation of tailings dams, etc.	– Change in landscape
Solid waste Generation of wastes Waste rock, tailings and mineral sediments	– Change in landscape – Silting of water courses
Solid waste Generation of wastes Domestic, oil, mixed and other wastes	– Change in water quality – Change in soil quality
Water resources Water consumption and generation of industrial effluents	– Reduction in water availability – Change in water quality – Change in soil quality
Atmospheric emissions Combustion gases and particulate matter	– Change in air quality

Area impacted and being restored by Vale¹

in km²

Year	Impacted area	Area being restored		
		Area undergoing permanent restoration	Area undergoing temporary restoration	Total area undergoing restoration
2009	39.4	29.7	5.4	35.1
2010	30.6	8.0	6.5	14.5
2011	17.2	7.3	17.9	25.2
Total	87.2	45.0	29.8	74.8

¹ The restoration of degraded areas is a gradual process, demanding medium- and long-term actions. The term "undergoing restoration" denotes areas in which such activities have been initiated and are in progress (initial restoration of certain ecosystem functions and gradual increase in species, with the aim of returning the vegetation to as close to its original state as possible). "Undergoing permanent restoration" corresponds to areas that will no longer be affected by the company's activities, while "undergoing temporary restoration" covers areas that may be used again in operational activities.

Opening and final balances for mineral production or extraction activities carried out by Vale¹

in km²

Year	Impacted areas opening balance	Impacted areas in the referred year	Areas in permanent restoration in the referred year	Impacted areas final balance
2009	524.6	39.1	29.6	534.1
2010	719.4	30.4	8.0	741.8
2011	584.7	15.1	7.2	592.6

¹ The year's opening balance represents the situation at the start of the year in relation to the total area of land to be restored. The final balance represents the situation at the end of the year in relation to the total area of land to be restored. Logistics operations are not included. Only mineral extraction, processing and manufacturing activities are included. Only areas undergoing permanent restoration are included, not temporary restoration.

GRI Reference

Indicators: EN11, EN13, MM1

Innovation To help minimize the impact of mining on the landscape, soil and vegetation, the Vale Technology Institute is working in partnership with the Federal University of Viçosa, in Minas Gerais, Brazil on a research project that is assessing the potential for using tropical grasses for re-vegetation. These species have been chosen because they are very hardy and fast-growing. This will enable a natural ecological process to start working at decommissioned extractive areas and at deposits of waste rock or tailings.

The Vale Technology Institute and the Federal University of Pará are implementing a research project into carbon sequestration and the recovery of deforested mangrove biomes on the Ajuruteua peninsula in Bragança, Pará. The main aim of the project is to restore degraded areas of the mangrove swamp, while involving the local riverside communities and raising their environmental awareness.

Protected areas

Areas allocated for biodiversity conservation and protection play an important role in sustainable development and human wellbeing. They contribute to the maintenance of ecosystems, protecting and making available natural resources on which communities' livelihoods and society's economic growth depend.

Nature reserves protect the sources of the water resources that supply cities and, in many cases, contribute to the reservoirs of hydroelectric plants, thereby participating in the energy generation process; they protect the soil against erosion and degradation; they help to maintain carbon stocks; they protect remnants of native vegetation from deforestation and its consequences (such as emissions of greenhouse gases); and they are home to endangered animal and plant species and the areas where they reproduce (birds' nests and fish nurseries, for example).

These areas are also often important sources of plants with medicinal and pharmacological properties, as well as other products of economic interest (fibers, timber, resins, etc.), contributing to the generation of benefits for the community.

All of these factors contribute, directly or indirectly, to the diversification and development of the local economy, enabling other activities such as tourism and the sustainable use of naturally sourced products².



Authors of the case study:
Standing: Arif Yasin
Laduri, Malunto Yusran,
Viktor Kristian Podandi,
Erlin Harry, Harun
Tandioga, Ismul Ausam,
Yohan Lawang. In the
front: Hendra Syamsu,
Aris Ambodo, A. Nur
Taslim, Erwien Rusli

Case Study

Rehabilitation of degraded areas in Indonesia

In Indonesia, the company has established a plan to recover the nickel-producing region where it operates. This plan includes a series of actions that will reduce the impact of mining operations and contribute to the recovery of the mined area. For four consecutive years, the initiative has been recognized with the award by the government of Indonesia for the best mine rehabilitation program. The plan could also serve as a benchmark for other Vale recovery programs around the world.


A key part of the plan is to ensure that the company optimizes its land disposal process, paying particular attention to water run-off issues and making sure that Vale disposes of the most fertile soil it excavates into areas that are being recovered and replanted. By applying soil management and controlling the erosion and re-vegetation process, the initiative is helping reduce the amount of earth that is eroded, and also ensuring that the vegetation that is planted in these areas will grow at a more appropriate rate, from three to five years following the use of the land.

In addition, Vale maintains a nursery which has the capacity for more than 700,000 trees, which will be used to replant the land with native and multi-purpose tree species.

Vale's investment in the recovery of mined areas in Indonesia was US\$8.9 million in 2010 and 2011. As a result, in 2011 about 200 hectares (2km²) of land was restored with the planting of native vegetation, which is the same level as was achieved in 2010.

The program is also focused on the mine's environmental and social legacy, and aims to ensure that once mining operations in the region have been concluded, there will still be opportunities for job and income creation.

Vale currently protects nearly 13,700 km² of natural areas, including conservation units in partnership with local governments (97%) and sites belonging to the company (3%). This total is 3.5 times larger than Vale's operational areas, which cover 3,900 km² in all.

The areas protected by Vale include regions in the Amazon Rainforest (64%), Atlantic Forest (25%), Wallacea (9%), Cerrado (2%), Boreal Forest (<1%) and New Caledonia (<0.1%) biomes. The company believes in the importance of protected areas for the conservation of species and ecosystems, as well as the ecosystem services provided by them. 

Operational areas

In 2011, the operational units for which Vale was responsible covered 3,846 km²³, representing an area smaller than the Carajás National Forest in Pará, Brazil, which covers 4,119 km², and which Vale helps to protect. Of this total 3,846 km² area, 99.5% is related to surface operations and 0.5% relates to underground operating units.

Of the company's total operational area, 4% is located within legally protected areas (conservation units) and 43% is located in areas of high biodiversity value (outside protected areas) as defined by the governments

² Activities carried out inside protected areas depend on the type of operation that is permitted, which is defined according to the protection category for each unit.

³ In 2011, improvements were made to data collection procedures (greater precision in the delimitation of operational units and preparation of geo-referenced data), and the criteria for including future projects were adjusted (units are now only included if they have received a construction license).



Commitment

Contribute to the conservation and sustainable use of biodiversity and ecosystem services⁴, promoting engagement with communities, governments and stakeholders

of each country. Considering operations adjacent⁵ to sensitive areas, about 10% of the total operational area is associated with legally protected areas and 8% is related to areas of high biodiversity value as defined nationally⁶.

The areas reported are used for mineral extraction, industrial production activities (processing), and product transportation (railroads and ports), as well as operations related to the planting of industrial forests. Inactive operational units in the Ferrous Metals Area, the Simandou Iron Project and bio-energy plantations (Biopalma) were included in the 2011 reporting scope. Due to the sale of the aluminum operations, the data for these operations are no longer considered in the 2011 report.

A large proportion of the regions where Vale operates is classified as of special natural importance in a global context. In all, 3,586 km² of Vale's operational areas are located in hotspots or wilderness areas⁷. This is equivalent to 93% of the total area of the company's operations.

Hotspots include operations in the Cerrado (Brazil), East African Coastal Forest (Mozambique), Forests of Guinea (Guinea), Atlantic Forest (Brazil) and Wallacea (Indonesia) biomes, as well as areas in Japan and New Caledonia (16% of Vale's total operational area is located in hotspots).

Vale's operations in the Amazon Rainforest (Brazil), Arab Deserts (Oman), Boreal Forest (Canada and Norway) and Pantanal Wetland (Brazil) biomes, in turn, are associated with regions classified as wilderness areas, and amount to 77% of the company's total operational areas.

Despite this, in many cases the company's operations were established in locations that had already been environmentally and biologically altered by previous human activities (such as timber extraction and cattle raising), or that were exclusively designated for industrial activities (such as municipal industrial zones). This applies to all types of Vale's operations, especially its industrial forests, which are entirely located in previously altered areas. The area occupied by this activity represent around 70% of the total operational area for which Vale is responsible.

Regardless of each area's initial state of conservation, Vale plans and implements its operations to minimize environmental impacts, and conducts parallel environmental initiatives to make a positive contribution to the

⁴ Functions performed by ecosystems and species, permitting living conditions on the planet to be maintained, including the provision of support and regulatory resources and services.

⁵ To calculate adjacent area, a buffer zone measuring 10 km from the external boundaries of protected areas and areas of high biodiversity value was considered, and its overlap with operational units was assessed. When an operating unit was associated with more than one protected area or area of high biodiversity value, the overlapping buffer zone was considered. Areas related to indigenous lands were not considered in this analysis.

⁶ Estimated data.

⁷ Hotspots and wilderness areas are large geographical areas considered to be important for world flora and fauna conservation. They are complementary categories of biodiversity importance, and are officially recognized by various international organizations. Hotspots are more endangered areas with high biological value for the planet and a large number of endemic vascular plants reduced to no more than 30% of their original vegetation coverage. Wilderness areas, in turn, are large areas of land (over 1 million hectares each) with representative biodiversity where there is little change or are unchanged (wild areas), with over 70% of their original coverage intact and human density lower than or equal to five people per km².

GRI Reference

Indicator: EN12



Authors of the case study —
Team in Corumbá: Anderson Polarini, Marcia Hindi, Jane de Arruda, Cinthia Maria Pereira, Benjamina Sorriha de Moraes, Marconi dos Anjos, Rosilene Silva, Túlio Nascimento (above). **Team in Carajás:** Pedro Araújo and Arthur Cardoso (left).

Case Study

Ecological blankets

When it is recovering areas that have been degraded because of its mining operations in Corumbá and Carajás (in the Brazilian states of Mato Grosso do Sul and Pará, respectively), Vale uses “ecological blankets,” also known as “bio-blankets.” These are made 100% out of natural fibers from coconut and the herbaceous plant *taboa*, woven into large degradable nets using cotton and polypropylene.

These actions are designed to mitigate environmental and socioeconomic impacts in the regions. They ensure that the earth remains stable and that vegetation can return to near the state that it was in before these extractive activities began. The covering reduces the possibility of erosion and makes the location more stable, so that seeds can germinate, the new vegetation can establish itself, and sediments are not washed into bodies of water.

The project in Corumbá is being carried out in a partnership with the Federal University of Mato Grosso do Sul (UFMS) and with the riverside community of the Cervejaria neighborhood in Corumbá. Community teams from the neighborhood have been trained in how to produce and use the new kind of nets and in how to handle the plant species.


In Carajás, the bio-blankets have been applied at a distance of 35 km from the town center of Parauapebas, on the border with the municipality of Marabá (Pará, Brazil). The bio-blankets work together with the sediment retention structures and materials for the rapid growth of the plants. They also contribute to the income of the community that lives by the rivers by the Furnas Project, as well as resolving water use problems in the local community.

The application of this technology could also be replicated in other regions where the conservation of water resources and the recovery of vegetation are required.

maintenance and conservation of local biodiversity. The company is reinforcing its respect for biodiversity, recognizes its impacts and is committed to acting in line with its values.

As a member of the International Council on Mining and Metals (ICMM), Vale has pledged not to begin to explore areas classified by UNESCO as World Heritage Sites and governed by the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage. These sites of outstanding global importance are no-go areas for Vale.

Biodiversity management plans

The company deems it necessary to conduct biodiversity management actions at all its operations that have negative impacts on species and ecosystem services. Together, these actions form each unit's Biodiversity Management Plan and are defined for each unit individually and in accordance with their unique characteristics. 

Targets To strengthen its commitment to biodiversity conservation and the sustainable use of natural resources, in 2011, Vale began a study of methodologies for measuring the impact of its operations. By analyzing and weighting the negative and positive effects of its activities on biodiversity and ecosystem services, the company will transparently and consciously assume a global positioning based on targets, so that its operations have a net positive impact. In 2012, the plan is to determine the methodology to be applied to all Vale.

Governance and engagement

Vale recognizes the complexity of the biodiversity topic and, more specifically, the issue of environmental restoration, which is fundamental to its efforts to minimize the main direct impacts of mining on species, ecosystem services and territory. In 2011, the company established a management area dedicated exclusively to



Challenges

Minimize land use impacts

Conserve and restore areas

environmental restoration of mined and degraded areas. This area has the objectives of producing standards, establishing indicators, conducting research, and looking for and reporting best practices in environmental restoration at Vale.

Besides effectively incorporating the biodiversity theme in the Environmental Management System (EMS), a specific global regulatory document is being prepared to guide biodiversity management at Vale. This standard is in the validation stage, and one of the main targets for 2012 is to approve it for global application.

The document sets out the company's biodiversity management strategy and, as a premise, highlights the importance of the sustainable use of natural resources, based on five guidelines:

- Knowledge of the biodiversity and ecosystem services present in areas of interest and locations where Vale operates;
- Evaluation, prevention, control and minimization of operations' risks and impacts affecting biodiversity and ecosystem;
- Continuous monitoring of operations' effects on biodiversity and ecosystem services;

- Investment in conservation of biodiversity and ecosystem services; and
- Promotion of exchange of information and technical and scientific cooperation.

When conducting its activities, Vale follows government regulations prevailing in the countries where it operates and produces internal requirements, adopting Brazilian legislation as the operating parameter in countries where there are no specific regulations or if these are less restrictive.

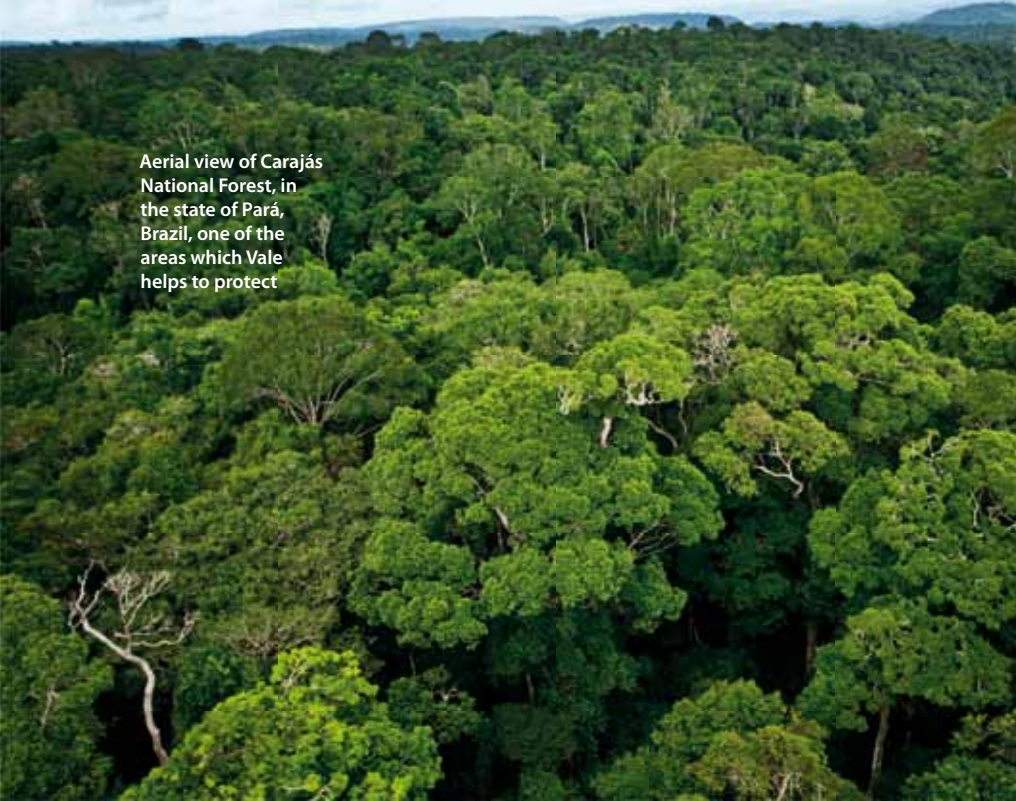
Actions in 2011

To help it determine its biodiversity strategy, in 2011, Vale and the Brazilian Foundation for Sustainable Development (FBDS) conducted an engagement and consultation action involving the company's strategic stakeholders, including representatives of Brazilian and other organizations.

As a result of this initiative, Vale identified gaps and opportunities for action, above all concerning the need to improve the communication of initiatives under way and to maintain clarity as to their impacts.


Another important initiative in 2011, conducted in partnership with Conservação Internacional do Brasil (CI-Brasil), was the development of the Integrated Management Plan for the Private Reserves of Natural Heritage maintained by Vale in the Iron Quadrangle region of Minas Gerais, Brazil. The main aim of this plan was to develop a strategy for the integrated environmental management of the reserves, in order to maximize synergies between them and their interaction with their surroundings, strengthening their contribution to biodiversity conservation. The plan was designed for a five-year period beginning in 2012.

A third initiative in 2011, in partnership with Accenture, was the development of a Master Plan for a Biodiversity Conservation Education and Research Center at the Vale Natural Reserve in



Aerial view of Carajás National Forest, in the state of Pará, Brazil, one of the areas which Vale helps to protect

Linhares, Espírito Santo, Brazil. The plan's objective is to better develop and strengthen the Reserve's vocation. The document establishes the Center's concept, mission, values and objectives, defines its operating scope in education and research, and sets guidelines for management and the establishment of national and international partnerships. Implementation of the Center at the Vale Natural Reserve will start in 2012.

In 2011, Vale continued its partnerships for the environmental rehabilitation of areas of importance to biodiversity conservation and local communities. 

Respecting biodiversity in New Caledonia

Vale Nouvelle-Calédonie (VNC) or Vale New Caledonia⁸ is located in the South Province of the territory and is home to an ecosystem of unique biodiversity. In recognition of the natural importance of this region, this province is the location for one of the World Heritage Sites established by Unesco, "Lagoons of New Caledonia: Reef Diversity and Associated Ecosystems". Vale's operations are located next to this area and are administered in a way that is compatible with maintaining the value that has made the site a World Heritage Site. Vale is acting in accordance with the commitments it has assumed at the ICM

and aims for continuous improvements in its processes and actions.

In 2002, for example, on completion of the Environmental Impact Assessment at one of the units, concerns were raised about the environmental programs that were proposed. In response, various independent governmental organizations, such as the Institut National de L'Environnement Industriel et des Risques (INERIS), the Centre Européen de Recherche et d'Enseignement des Géosciences et de l'Environnement (CEREGE) and the French Environment Ministry undertook their own complementary studies.

These assessments resulted in a further 50 additional recommendations that have been implemented by the company and that VNC is currently monitoring and analyzing, ensuring continuous improvement in the company's management of the environment and of local biodiversity. For example, the company has built a sediment basin in the northern tributary of the Kwe River to prevent soil from being washed into this river, which flows into the Merlet Reserve, as happened in 2006.

Engagement with local stakeholders⁹ forms a major part of VNC's social and environmental management program. There is a framework that structures this process, as reflected in the Pact for Sustainable Development of the Great South that the company signed in 2008.

The Pact provides for an indigenous consultative committee for the environment and a corporate foundation which is investing in social, cultural, environmental and economic projects in the region. It also includes a reforestation program that aims to recover sites that are relevant to the local community.

These activities are carried out with the participation of representatives from local indigenous communities


⁸ Since 2006 Vale has held a majority stake in this company, although operations started in the region in 1969.

⁹ The local environmental authorities for South Province, L'Observatoire de l'environnement en Nouvelle-Calédonie (OEL), the Biodiversity Conservation Convention, and the Mines and Energy Department of New Caledonia (DIMENC).

Aerial view of
Vale's operations
at Voisey's Bay in
Canada




that live next to the operations, public administration and non-governmental organizations such as Rhéébù Nùù, to ensure a coherent integration of the project.

This process of engagement reflects VNC's commitment to understanding local needs and expectations and to providing transparent information about its performance in questions related to sustainability. Dialogue is helping to establish increasingly respectful and trusting relations, [supporting the company's positive results in the region and strengthening its social license to operate.](#) 

Land use conflicts

In 2011, Vale was involved in 23 cases considered significant due to the fact that they involved lawsuits (nine cases) or involved shutdowns of projects and operations or the blocking of access to them (14 cases). Vale recognizes the challenge of finding solutions that meet the needs of both the company and communities, and seeks to base its actions on respect.

The company regrets these conflicts and has strived to establish more effective communications with society in general, as presented in the Overview section. The construction of

positive relations is a two-way process and, in this endeavor, [the company counts on the participation of all those interested in favorable results for the planet and people.](#) 

Mine closure

Vale understands that from the moment a mining project is planned, one should start to establish guidelines for closing it, although the mine itself may operate for decades.

This is due to the fact that the ending of activities at a mine is associated with potential social, environmental and economic impacts that must be identified and evaluated in advance. Actions need to be planned to enable the effective mitigation of impacts and construct a positive legacy in the region.

All of the planning work for a mining project should incorporate the concept of the future use of the mined area, considering the region's potential and vocations, the sustainable use of resources, protection of environmental quality, and local and regional socioeconomic trends.

To guide this process, Vale has a set of principles and procedures in force, some of which are expressed in its Sustainable Development Policy. The Mine Closure Guide and Terms of Reference for Producing Mine Closure Plans are important references for the theme. The first, which is more conceptual, contains guidelines and best practices adopted by Vale, to orientate the professionals directly or indirectly involved with the theme; the second presents the content that needs to be included in a mine closure plan, serving to support company units.

The company has Asset Demobilization Procedures and Criteria for Financial Outlays, which guide calculations of cost estimates for closing mines. The estimated values for provisions are revised annually and presented in the company's financial statements. In 2011, the

GRI Reference

Indicators: EN12, MM6
MM7, MM10

Authors of the case study: Lisa Lanteigne and Quentin Smith



Case Study

Mine closure in Canada

The closure of a mine can have major long-term impacts on the environment, on people and on the company involved. Vale is very aware of this and at the Sudbury complex in Canada the company is working side by side with the local community in the decommissioning of mining operations and the monitoring of reclaimed areas in Sudbury.

When Vale acquired Inco in 2006, it became responsible for numerous properties. Two of these properties, Whistle Mine in the Sudbury area and the Shebandowan mine in North Western Ontario, were entering the decommissioning stage. Portions of the Copper Cliff Smelter slag pile were also being discontinued, a project that was implemented while the site continued to operate.

Vale undertook various surveys and analyzed all the alternatives in partnership with the local government, environmental experts and indigenous communities in the region to prepare for the decommissioning of the two mines.

The Whistle and Shebandowan closed mine sites will be monitored for the next 15 to 20 years. In 2011, the company's work consisted essentially of collecting soil and water samples, for monitoring data and carrying out safety inspections. The recovery of the Smelter slag pile will continue for the next five to seven years.

In 2011, Vale invested more than US\$10 million in these projects, recovering 994 hectares of land. During the process for decommissioning the Whistle mine site regular meetings were held with the community, including representatives of the Wahnapiatae First Nations who live about three kilometers from the mine.

As a result of this process of dialogue, the original plan has been modified to respond to the concern of local communities that the mining sites should return as much as possible to their original 'pre-mine' state.

estimated amount for provisions to demobilize Vale's assets was US\$1.77 billion. According to the data on environmental spending (see p.63), US\$82 million was spent on mine closure initiatives. 

The perception of the dimensions of a closure operation has evolved over time within the company. With the development of closure plans for all mines, they have become important management tools, making it possible to generate alternative options to be implemented over the lifecycle of a mine to minimize the risks of negative impacts and maximize the local potentialities of communities and the region.

For operations in Brazil, the multi-year target plan envisaged completing closure plans by 2013. In the case of mines in other areas where Vale operates, procedures produced for operations in Brazil are adapted to meet different legislative requirements.

As a result, an evaluation is under way at Vale to develop an international standard covering the different situations faced by the company's operations across the world, contributing to the generation of positive legacies for society by promoting sustainability.

Tailings and waste

In 2011, Vale spent US\$298 million (29% of its total environmental expenditure) in tailings dams, dikes and waste rock piles, and US\$61 million (6% of total environmental expenditure) in non-mineral waste, in order to reduce its impacts related to the generation and disposal of both types of waste.

Vale is working to reduce the amount of non-mineral waste generated by its activities. Part of this material may also be recycled, making it possible to add value to it and create opportunities to generate income for surrounding communities. Waste of mineral and metallurgical origin, such as tailings, waste rock and slag, has different characteristics and is treated in specific ways.



Authors of the case study:
Geraldo do Vale and
José Moura Farias

Case Study

Innovating to retrieve iron ore

Vale is committed to reducing the environmental impacts of its activities in the regions where it operates, and is investing in technology that enables it to use ultrafine iron particles that are deposited in the tailings dams in Carajás following iron processing. The company uses this technology in two tailings dams in the Carajás mining complex in Parauapebas, in southeastern Pará, Brazil.

The initiative aims to retrieve the sediments and waste that are generated during processes and which contain iron content. Deploying innovative technology, Vale is now able to reprocess this material and incorporate it into its mineral production. Besides the financial benefits, this technology is also reducing the impact of mining on the environment, as it reduces the amount of waste sent to tailings dams.

The process of retrieving the iron ore from the tailings dam is a simple, low cost procedure, which does not generate waste and which basically uses a floating dredging device to collect the material, which is then stored temporarily in containment structures where excess water is removed, before being sent to a sifting station to separate organic material. In the Geladinho tailings dam in Carajás, over two million metric tons of iron ore have been recovered in this way.


At the Mina do Azul manganese operation, the tailings dam is a certified reserve of 4.5 million metric tons of manganese particles with average content of 23.5% ROM (run of mine, before processing), of which 0.2 million metric tons of fine particles have already been recovered. International mine consultants Pincock & Runge certified the company as the first mine in Brazil to have its tailings dam officially recognized as a mineral reserve. In total, approximately 2.5 million metric tons of fine particles have already been reprocessed.

Mining and mineral processing waste

The generation of mineral waste such as tailings and waste rock is intrinsic to mining activities and occurs because the extraction of minerals entails the removal of mineral materials which are not used. They are disposed of in tailings dams (containing tailings, water and sediments) and piles of waste rock and ore. Vale also has metallurgical operations in its manganese and nickel businesses, in which waste rock is generated and is then disposed of in piles.

Vale carries out projects to reuse tailings and slag in other industrial processes, such as the production of cement, ceramics and other aggregates.

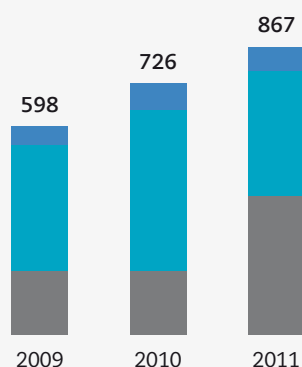
The systematization of information provided by the Tailings Dams and Piles Management System (SGBP), implemented in 2009, has enabled the consolidation of data on geotechnical structures, creating business risk indicators and spreadsheets for operational and corporate areas. The SGBP is an important online management tool, aiding decision making about investments in new structures and strategies for raising production.

The management of tailings dams and waste rock piles includes a corporate technical safety audit every three years. In 2011, the fourth phase of corporate audits took place, covering Vale Brazil's existing 241 tailings dams and 173 waste rock piles, reaffirming its commitment to safe facilities and to environmental controls. In addition to the technical audits, the management process is assessed periodically through specific audits of compliance with Sarbanes-Oxley Act control requirements. 

In 2011, there was an increase of approximately 19% in the generation of tailings and waste rock, to 867 million metric tons, due to a rise in production. Specifically in terms of iron ore, the amount of waste rock generated fell by 13% per unit of

Total ore and metallurgic waste

Million metric tons



	2009	2010	2011
Iron ore			
Tailings	53	75	67
Iron ore			
Waste rocks	360	461	401
Other business areas¹	185	190	399
Total	598	726	867

¹ Including waste rock and tailings from nickel, potash, manganese, coal and copper mines, as well as slag (manganese alloy), red clay (alumina) and Spent Pot Liner (aluminum).

Projects implemented by Vale aim to make it possible to reuse mining waste as raw materials in other industrial processes

production, as a result of the current geological characteristics of some mines, as well as ore processing improvements.

Continuous improvement in the productivity of iron ore processing plants has generated greater ore recovery from tailings in some of Vale's tailings ponds.

With regard to slag generated in metallurgical processes, the company has been working to develop new applications in areas such as construction, paving and the fertilizer industry.

Non-mineral waste

Mining activity also generates non-mineral waste. As in the case of mineral waste, Vale is committed to reducing the amount of non-mineral waste it creates, and seeks to add value to this material.

The management strategy is to invest in improving processes, recovery, reuse and recycling, guaranteeing proper disposal to achieve the objective of maintaining the integrity of the environment and the quality of life of the communities near Vale's operations.

In order to add value to waste, Vale sees the opportunity to encourage the development of the local economy, generating employment and income by reusing and recycling these materials.

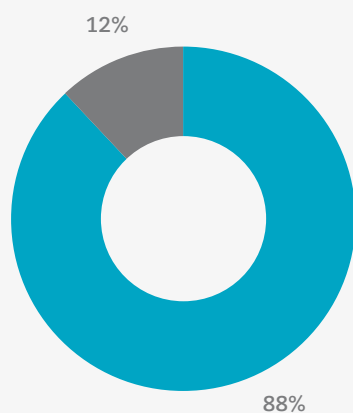
To encourage recycling and to reduce the amount of hazardous waste generated, all business areas in Brazil, except Fertilizers, had targets to increase the percentage of waste recycled and reduce the quantity of hazardous waste generated in 2011, as part of the Action Plan on Sustainability (PAS).

GRI Reference

Indicator: MM3

Generation of waste

Total = 686,000 metric tons (2011)



Non-hazardous (604,000 metric tons) 88%

Miscellaneous (e.g. electrical and electronic waste, wiring, PPE)	25%
Metallic	21%
Household waste	11%
Sand, crushed stone and rubbish	10%
Wood	6%
Rubber and tires	3%
Other non-hazardous waste	12%

Hazardous (82,000 metric tons) 12%

Sludge	6%
Oil, grease and waste contaminated by oil and grease	1%
Other hazardous waste	5%

GRI Reference

Indicator: EN22



Author of the case study: Paul Davies

Case Study

Generating value from waste

At Vale's nickel refinery in Clydach in the United Kingdom, a waste reduction project has leveraged the engagement of the company's employees and their innovation to deliver significant results. In 2011, 85% of all waste produced at the refinery, including hazardous waste, was recovered or recycled. The refinery's target is for 100% of its waste to be reused, recycled, or used to produce renewable energy within the next five years.

The initiative has reduced the disposal of waste in landfill or other sites, stimulated the local economy and raised the environmental awareness of company employees. Any waste material of value is sold, leading to an average annual income of 55,000 pounds, or about 88,000 dollars. This money is then invested in maintenance of the refinery's waste treatment unit. In 2011, 60% of the maintenance costs of this unit were paid for out of this income.

The Clydach refinery has been operating since 1902. It is located in a small village of the same name, about 300 km west of London, and has around 200 employees and 100 contractors. The business unit is certified for ISO 14001 and 9001 and OHSAS 18001, and has adopted a strategy of continuous improvement in the waste management area, in accordance with Vale's values of economic and environmental responsibility.

Before the project began in 2009, waste was separated into four types: metal, wood, special and general. To improve the system for managing the waste from nickel production, changes were required. The company decided to involve all its employees in this effort, using the support of a specialist consultancy to help train employees and change the culture at the refinery.


The 70% target for recycling, in relation to the total quantity disposed of, was surpassed. A waste recycling rate of 73% was achieved, demonstrating the development of joint work by the company's operational service areas. Of the operational departments with targets for reducing the amount of hazardous waste generated, around 80% achieved them.

Regions with logistics problems and a lack of waste disposal technology present the greatest challenges in waste management. This requires investment by Vale in proper storage, transportation optimization, technological development and, above all, the construction of local partnerships in line with local cultures and standards of development.

To tackle its main risks and difficulties, the company is active in research, environmental education, the development of technology projects, and the construction of partnerships, thereby helping to create new business chains.

Vale supports its suppliers to conduct research offering technological solutions for waste management, which also contributes to income creation and the generation of local jobs. Projects to make use of materials seek symbiosis with other industries so that waste can also be used as raw materials.

Non-hazardous and hazardous waste

In 2011, Vale generated a total of 686,000 metric tons of waste: 88% of which was non-hazardous and 12% hazardous. The iron and nickel businesses generated the most waste, accounting for approximately 75% of the total. 

An operator of an iron ore thickener at the processing plant in Carajás, Brazilian state of Pará, Brazil



Only considering units present in the scope of the 2010 report, there was an increase of approximately 48% in waste generation. The main reasons for this increase were a significant increase in waste generation in the nickel business through the incorporation of new waste-generating processes, and growth in waste generation inherent to higher output.

The expansion in the scope of the report, with the entry of data on operations in Mozambique, Peru, Oman and New Caledonia, as well as Vale Fertilizantes' units in Brazil, also contributed to the increase. [!\[\]\(666e09182d4cd268646ea700ea60dcdf_img.jpg\)](#)

On the other hand, the iron and manganese areas, the main generators of hazardous waste at Vale, did not produce more waste, despite an increase in ore production, implying a rise in the usage of this material. About 99% of the hazardous waste generated by the manganese area is related to dust and slurry generated in the systems of dust collectors and gas scrubbers used to control emissions.

The main generating units of hazardous waste are Vale Manganese Norway and Vale Manganèse France, due to the different methodologies used to classify waste in Brazilian legislation.

As in previous years, the waste disposal profile continues to prioritize recycling and use of materials. Approximately 40% of disposal takes place in landfills/piles. [!\[\]\(e3f8612927870f2e0f9f5989e6dd3064_img.jpg\)](#)

Spills

In 2011, eight occurrences involving spills of hazardous products were recorded. They were classified as critical accidents ¹⁰, in line with Vale's relevance matrix. Compared with 2009 (five spills) and 2010 (no spills), there was an increase in this type of occurrence.

As spills can damage the environment, the company has effective emergency response plans. All units acted to remediate the impacts of these eight occurrences and to investigate them, in order to avoid further spills. All procedures were followed, legislation was complied with, and there was no irreversible damage. [!\[\]\(faf942dc3e59ce8eb64b4ac481eca7e0_img.jpg\)](#)

GRI Reference

Indicators: EN23, EN26

¹⁰ "Significant spills" as defined by the GRI correspond to the definition of critical accident used by Vale, i.e., accidents that go beyond the property boundary of an operational unit and have a residual impact on the environment and/or health and safety, inside or outside the operational unit, after the completion of mitigation procedures.

Prevention principle

Process	Practice implemented	Environmental Benefits
Pellets/coal	Control of dust generation	Reduction in particulate matter
Copper	Moisture control	
Potash and phosphates	Use of additive to coat fertilizers	
Logistics	Rainwater collection and reuse of water	Reduction in the use of natural water resources
Copper	Use of closed warehouses	Reduction in soil and water contamination

The priorities in waste management continue to be reducing the amount of hazardous waste generated, maximizing the reuse of waste at Vale units, and minimizing disposal in the ground

Prevention

Vale's business areas employ pollution prevention principles in operational processes by implementing an integrated strategy. Mass and energy are measured in operations to identify significant environmental aspects involved and to quantify losses through the generation of wastes and emissions.

Based on this approach, the company replaces raw materials and inputs, refines technological processes, establishes best practices for manufacturing, and proposes

actions to control and improve the eco-efficiency of processes.

In Carajás, an innovative ore screening process is used. Once extracted, the ore is screened, adding value to the different products arising from this process. In order to screen iron ore, the use of water has always been fundamental. However, a new technology developed entirely by Vale enables screening to take place using the material's own moisture.

Besides cutting water consumption by the equivalent of that used by a city of 430,000 inhabitants (19.7 billion liters per year), the technology also reduces power consumption by more than 18,000 MW per year and means that tailings dams do not have to be built.

In terms of controlling and reducing the toxicity of production inputs, Vale, in accordance with legislation, does not use substances classified as persistent organic pollutants — which do not break down in the environment — or that contain more than a certain concentration of benzene. The company also follows guidelines prohibiting the use of substances whose acute or chronic toxicity test results exceed specified values.

In addition, Vale works on technological innovation, seeking alternative ways of reducing mineral and industrial waste through studies on using ore fines from tailings, and utilizing cleaner, more efficient energy sources, among other initiatives.

A concrete example of this is provided in Moatize, Mozambique, where waste from coal mines will be used to generate electricity, which will power Vale's operations while also contributing to improving energy security and supplying local people with energy.



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011



42%

.....
the increase in
total investments
compared with 2010

View of the Port
of Tubarão, Vitória
(Espírito Santo), Brazil

Creating Value

The challenge of being a transforming company

86%

.....
the share of local suppliers in purchases at Vale

In this chapter

Value chain

Development of local suppliers

Customers

Value added



Commitment

To promote the sustainability agenda among suppliers and customers. In particular, this means **not condoning violations of human rights in the value chain** and promoting the development of suppliers in the regions where Vale operates.

US\$ **18 billion**

the amount that Vale invested in 2011



US\$ **418.1 mn**

the total loans and financing provided by the **Inove program** in the last three years

380

the number of companies trained by the Inove program since its creation in 2008

GRI Reference

Indicators: HR1, HR6, HR7

Creating value

Value chain

Vale depends on its supply chain and customers.

The challenge lies in replicating the company's sustainability agenda among these stakeholders, especially on subjects related to child and slave labor, as well as environmental issues. As a global company, Vale has the opportunity to help spread best practices, strengthening the process of change in pursuit of sustainable development.

Guided by its policies on Human Rights and Sustainable Development, Vale seeks to establish relations with suppliers, partners and customers that share the same principles and values, promoting awareness and practice of human rights, and continually improving evaluations of violation risks. The company recognizes this major challenge and knows that it has not yet achieved its main objective, which is to ensure that all parts of the chain are engaged with the sustainable development agenda. Consequently, Vale is committed to proactively taking measures in order to strengthen its role as a transformational agent.

With regard to child labor, exposure of young people to hazardous work, and incidents of forced labor or labor similar to slavery, Vale's internal risk may be considered non-existent. For more details, see the Human Rights section of the Strategic Vision. There is, however, a greater possibility of these risks occurring in the company's



Employees at the Maritime Terminal of Tubarão, Vitória (Espírito Santo), Brazil

value chain, specifically in certain sectors such as charcoal and pig iron production in Brazil, which are recognized as being critical sectors in relation to this subject.

To prevent these risks, Vale constantly evaluates its suppliers' and customers' contracts and situation. Since 2008, the company has included clauses in contracts with clients in Brazil allowing it to terminate iron ore supply contracts if there is evidence of non-compliance with obligations relating to environmental protection, and the non-use of child labor or slave labor.

In terms of analyses of merger processes and new acquisitions¹, social aspects are of extreme relevance to the taking of strategic decisions, considering possible social risks and impacts. The themes analyzed include the following: commitment to human rights and analysis of possible

¹ In all cases of acquisitions in 2011 (whether or not they went ahead), human rights issues were evaluated.



Challenges

.....

Develop suppliers
in the regions where
Vale operates

Contribute to
the **eradication**
of child and
slave labor/labor
similar to slavery in
the supply chain

Vale requires that all its
productive chain (suppliers
and clients) respect Convention
105 of the ILO, concerning the
abolition of forced labor

Pig iron Activities related to the production of pig iron in Brazil involve more than 30,000 people, including direct and indirect jobs, and generate US\$360 million in annual income². Major questions surround the pig iron production chain, concerning deforestation, illegally sourced charcoal and human rights violations. Vale recognizes that the problem exists and assumes the commitment to mobilizing the relevant actors to find solutions to these problems.

violations; resettlement processes; identification of nearby indigenous peoples; social impacts generated by operations; and the focus of social investments.

All of Vale's operations conduct systematic risk analyses for child labor and young people exposed to hazardous work.

In Brazil, there is a monitoring mechanism based on the list published by the Ministry of Work and Employment that identifies cases of companies and/or individuals reported for possible occurrences of forced labor. Based on this list, Vale checks suppliers' records to guarantee that none of them, whether companies or owners, are involved in such issues. In the event that a violation of human rights is proved by government authorities and through instruments provided for in legislation, the respective suppliers/partners or customers are notified and instructed to take the proper corrective measures.

Otherwise, Vale may break off its commercial relations with them.

Focus on transformation of the pig iron value chain

In 2011, some of Vale's customers who use iron ore to produce pig iron were accused by NGOs of buying illegal charcoal³. Following a notification from Ibama, the Brazilian Environmental Institute, Vale suspended the sale of iron ore and its transportation to three companies.

Following these events, and to ensure that Vale is not a participant in deforestation, the use of illegal charcoal or the abuse of human rights, the company mobilized a

GRI Reference

Indicator: HR2

² Analysis by Phorum Consultancy — with a multiplier effect of 2.5 for employment and income, and using 2012 data from the IBGE, the Brazilian Statistics Institute.

³ Source: *Report into Sustainability in the Pig Iron Supply Chain*, Observatório Social Institute, Repórter Brasil, Papel Social and Ethos Institute.


number of major players in this area, to develop a Program of Independent Audits in the Supply Chain.

The program aims to promote the sustainability of the steel supply chain, engage and assess producers of pig iron for sustainable social and environmental practices, and to encourage an increase in the supply of raw materials (wood and charcoal) from renewable and legal sources, to meet the demand from this sector.

The first stage of the program will provide capacity building to orient the companies that will be audited under the program and to suggest action plans for items that will be assessed. The second verification stage will score and classify the companies on an annual basis.

By implementing this program, Vale aims to guarantee that it supplies iron ore only to sustainable operators.

It is important to note that as of today, when the program is being developed, the company is already offering a sustainability bonus to companies that source over 80% of their charcoal from their own forests. This bonus is currently received by two customers: Queiroz Galvão and Plantar.

Vale's supplier selection and registration processes are guided by compliance with requirements related to its Human Rights and Sustainable Development policies, as well as criteria of legal, financial, tax, health and safety, and environmental nature. The records are periodically updated and verified in accordance with these requirements. 

Development of local suppliers

Vale prioritizes the hiring of local suppliers in order to boost the economies of remote regions where it operates and to qualify and develop companies to operate in an increasingly competitive market.

In line with the company's sustainability strategy, since 2008 Vale has been carrying out its Inove



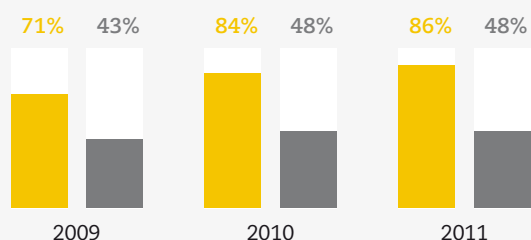
Conveyor belt for pig iron in the Paul Quay at the Port of Vitória, Vitória (ES), Brazil



Good practices must be replicated throughout the value chain. If sustainability is an internal value, Vale has the duty to act as a multiplier with its suppliers and clients

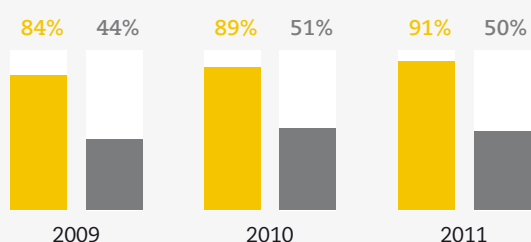
Ricardo Piquet,
Corporate Social Responsibility and the Vale
Foundation Director

Percentage of local purchasing in monetary terms – Global results



	2009	2010	2011
Average percentage of purchases in the country	71%	84%	86%
Average percentage of purchases in the state / region	43%	48%	48%

Percentage of local purchasing in monetary terms – Brazil¹

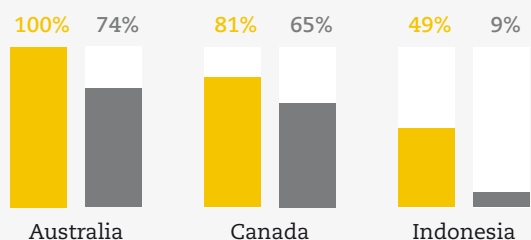


	2009	2010	2011
Average percentage of purchases in Brazil	84%	89%	91%
Average percentage of purchases in main states	44%	51%	50%

¹ The average percentage of purchases in main states in Brazil covers acquisitions by Vale's main operations in Espírito Santo, Maranhão, Minas Gerais and Pará.

Percentage of local purchasing in monetary terms – Other countries

(2011)



	Australia	Canada	Indonesia
Average percentage of purchases in the country	100%	81%	49%
Average percentage of purchases in major provinces / states	74%	65%	9%



A meeting
at work in
Sohar, Oman

assessments were made of about one thousand micro and small companies to identify opportunities to enhance their management. The results of this work and Vale's effort to develop the local economy have led to the participation of Brazilian suppliers in Vale's purchasing rising to over 90% in 2011. 📶

Vale's supplier relationship management encompasses three stages: qualification based on the company's values; evaluation of compliance with legal and contractual obligations; and monitoring companies' development and financial health. 📶

Health and safety with suppliers

Vale seeks to influence its value chain in the health and safety theme, encouraging the adoption of safety measures, awareness campaigns, inspections and audits.

In 2011, meetings for alignment and exchange of practices and experience were conducted with approximately 20 of the company's main suppliers of equipment and new technologies. Meetings were also held with 22 key general service suppliers, for the same purpose. At these meetings, participants formulated an action plan that will be tracked in 2012.

The company has audited and monitored improvements by 13 suppliers that have underperformed in relation to the company's expectations and need to improve their health and safety results in areas such as management systems, critical activities requirements and legal compliance. In order to improve management of contractors, Vale's stakeholders were involved in revising the Contractor Management Procedure in 2011.

As mentioned previously, Vale does not tolerate loss of life related to the company's activities. The challenge is great and the company knows that it will not be able to meet it in the short term, but Vale's top priority is to achieve the goal of zero harm, and it is involving its value chain in this effort. 📶

The expectation is that Vale's actions to develop local suppliers will generate increasing positive impacts in the medium and long terms

Program (www.vale.com.br/inove), which aims to strengthen the suppliers for its units in Brazil, which it believes are agents for sustainable development in the regions where they operate. Inove aims to develop these local suppliers using capacity building, lines of credit, and incentives for businesses, making them more competitive in the market. In the three years since its establishment it has awarded around US\$418.1 million in financing and loans, while 380 companies have signed up for classroom and distance learning initiatives.

In 2011, in partnership with the Brazilian Service to Support Small and Micro Companies (National SEBRAE),

GRI Reference

Indicator: EC6



An employee cleans copper sheets in Tres Valles, Salamanca, Chile

Customers


Vale perceives that the successful implementation of the sustainability agenda will lead to long-term competitiveness. For this reason, Vale's strategy to win and retain new markets is to pursue operational excellence to improve the quality of its own products, strengthen long-term relations with its customers and find solutions that meet their businesses' needs, in order to minimize impacts and create value. Vale uses the same approach in the various parts of the supply chain, such as suppliers of raw materials and service providers.

The supply and performance of products is evaluated through technical meetings and visits with customers, generally with teams from the Commercial, Marketing, Research and Development, Planning and Development, and Pelletizing areas. Technical visits, interviews, conference calls, trade fairs and exhibitions, a customer service center and regular satisfaction surveys are other methods that Vale uses to manage its relations with its customers and other stakeholders.


Solutions which focus on meeting the needs of customers add value to products, develop businesses and guarantee a long lasting relationship

Special attention is given to information for customers related to the health and safety impacts of products (when handled and used). There are standardized procedures for treating customers' complaints about product performance. Depending on the complexity of the problem, R&D resources may be used to study and enhance the product in terms of health and safety (such as air emissions, danger to health when used, and others).

Some of Vale's operations have programs that provide for the management of risks to safety, health and the environment over the course of their life cycles, in line with planned uses and the effectiveness expected of their materials and products.


These programs consider the different stages of design, production, distribution and usage, and constantly seek to reduce any indirect impacts on people's health and the environment. 

More information about the maritime transport of iron ore particles can be found in the 20-F report, in the Investors section of www.vale.com.

Life Cycle Analysis (LCA) is another tool used by Vale to produce significant gains in the eco-efficiency of its products. In this process, environmental impacts are determined, especially taking the following aspects into account: energy consumption; greenhouse gas (GHG) emissions; water consumption; generation of effluents; toxicity; and potential risk. 

When appropriate, Vale's production processes identify products using adequate methods throughout the course of the production process, enabling them to be tracked. This procedure allows the control and unique identification of records for monitoring and measuring products. The Vale Manganese units, Barbacena, Simões Filho and Ouro Preto, now have this procedure.

In the nickel and cobalt operations managed by Vale Canada, a product awareness and responsibility management area was recently established. This area is staffed by risk management specialists, and it reinforces the company's concern for the theme. At the same time, the marketing area has specific roles and responsibilities for product management, whether in the dissemination of information among customers or in the identification of specific environmental needs or expectations, such as product environmental declarations.

Reinforcing this positioning, in 2011 Vale Canada began developing its Product Responsibility Management System, with the aim of improving its policies and procedures, and defining the roles, responsibilities and powers in this area. 

Vale maintains open, formal, technical communications channels with its




Sustainable development is essential across all our businesses, from social and environmental responsibility to superior shareholder returns

Roger Downey,
Executive Officer of Fertilizers and Coal

customers, involving the participation of multi-departmental teams. Vale is engaged in numerous Technical Cooperation Agreements (TCAs), visits and technical consultancy assignments to support customers, in order to mitigate environmental impacts in the product post-sale stage.

The systematic compilation of absolute figures for reductions in greenhouse gas emissions in the use and post-sale stage of Vale's ferrous metal products is hampered by the highly extensive nature of its portfolio of customers and products and, in many cases, by confidentiality criteria attached to information shared by Vale and its customers.

Vale also seeks to comply with all prevailing standards and laws in the countries where it operates. In 2011, from the perspective of regulations, there were no cases of non-conformities or fines related to sponsorship, advertising and promotion of Vale's products, nor any problems related to the supply and use of products and services. 

GRI Reference

Indicators: PR1, PR2, PR5

PR6, PR7, PR9, MM11

Profile: 4.16




Mineral excavator in the stockyard of the Maritime Terminal of Tubarão, Vitória (Espírito Santo), Brazil

As well as life cycle analysis, other initiatives are underway to estimate and monitor emissions and to implement projects that measure the Carbon Footprint

Another activity conducted in 2011 was a revision of Vale's corporate procedure on hazardous product management, in particular to incorporate the United Nations Globally Harmonized System (GHS) for classifying and labeling chemical products.

This procedure also involves describing the risks associated with products through Material Safety Data Sheets (MSDS). These documents provide customers with all necessary information about products' physical, chemical, toxicological and eco-toxicological properties, as well as procedures for safe handling.

In 2011, Vale finished evaluating the risks and requirements for registering all chemical substances exported to or produced in the European Union, in accordance with Regulation (EC) 1907/2006 (REACH). Since then, it has been managing possible outcomes of the registration process, together with its customers, in particular to ensure the safe use of its products. 



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

Creating value

Value added

Economic value generated and distributed in 2011 ^I

In US\$ million

	Brazil	South America ^{II}	Canada	North America ^{III}	Australia and Asia	Europe	Africa	TOTAL
Economic value generated								
Revenues	52,774	623	5,100	—	2,221	370	19	61,107
Economic value distributed								
Operational costs	17,939	758	4,105	—	2,583	271	383	26,039
Employee salaries and benefits	2,949	57	974	—	452	51	34	4,517
Payments to capital providers	8,886	—	—	2,579	—	—	—	11,465
Payments to the government	8,442	—	634	645	449	—	—	10,170
Spending in the community	408	4	20	0	18	1	6	457
Total	38,624	819	5,733	3,224	3,502	323	423	52,648
Economic value generated minus economic value distributed	14,150	(196)	(633)	(3,224)	(1,281)	47	(404)	8,459

^I USGAAP accounting standards are used, with some adjustments in accordance with the methodology established by the GRI; in addition to gross operating revenues, revenues in the table include financial results and income from the sale of assets.


^{II} Except Brazil.
^{III} Except Canada.

In a year of great challenges, Vale delivered five new production projects, which will generate jobs and income for thousands of people.

Mining is an economic sector that is often seen from the perspective of its negative impacts. Vale recognizes these impacts and knows that it has to work continuously to be able to act as a transformational agent for society in terms of sustainable development. The commitments assumed in this report reflect this recognition.

Vale defends the important role of the mining sector for the production of key inputs for humanity's technological development and sustainability.

The economic value created and distributed by the company in 2011 was US\$8.5 billion. Net income attributable to controlling shareholders was US\$22.9 billion and operating revenue was US\$60.4 billion, 30% up on 2010. 

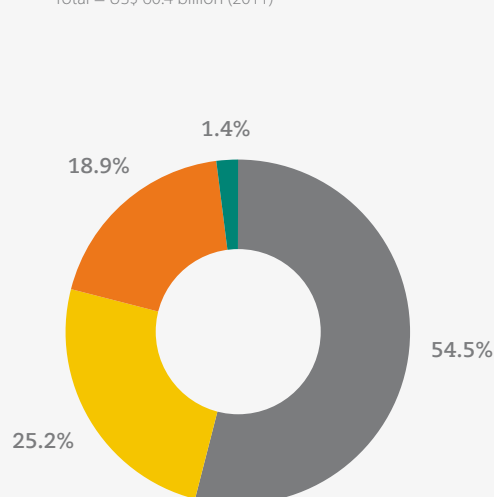
Five new projects started operations in 2010 and 2011 — Oman, Moatize, Onça Puma, Estreito and Katebbe — and six of them are still at the ramp-up stage, meaning that the bulk of their growth and value-creation potential will be materialized over the course of 2012 and 2013. Further information about Vale's results and tax incentives can be found in the Form 20-F in the Investors section of www.vale.com. 

GRI Reference

Indicators: PR2, PR3, EC1

Revenue by destination

Total = US\$ 60.4 billion (2011)



■ Asia
■ Americas
■ Europe
■ Rest of the world

Asia 54.5%

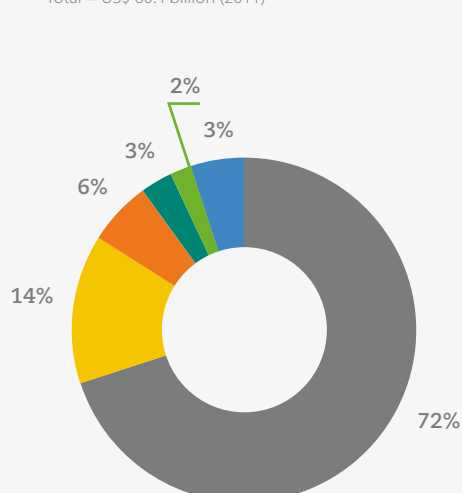
China	32.4%
Middle East	1.8%
Rest of Asia	20.3%

Americas 25.2%

Brazil	18.1%
Rest of Americas	7.1%

Revenue by product

Total = US\$ 60.4 billion (2011)



■ Ferrous
■ Base metals
■ Fertilizers
■ Logistics services
■ Coal
■ Others

Ferrous 72%

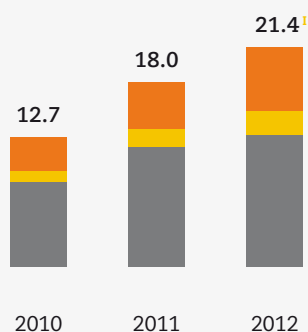
Iron ore and pellets	71%
Manganese and ferroalloys	1%

Base metals 14%

Nickel	9%
Copper	4%
Aluminum	1%

Investments by type

US\$ billion



	2010	2011	2012
Maintenance of existing operations	26%	25%	29%
Research and Development (R&D)	9%	10%	11%
Project execution	65%	65%	60%
Total	12.7	18.0	21.4[†]

[†] Estimated Value of Budgeted Investment

Production volume¹

In thousand metric tons (unless otherwise stated)

	2010	2011		2010	2011
Iron ore	296,995	311,785	Phosphate		
Pellets	36,291	39,027	Phosphate rock	5,256	7,359
Thermal coal	3,833	4,506	Single superphosphate (SSP)	2,240	2,638
Metallurgical coal	3,059	2,766	Monoammonium phosphate (MAP)	898	823
Cobalt (metric tons)	1,066	2,675	Triple superphosphate (TSP)	788	811
Manganese ore	1,841	2,556	Dicalcium phosphate (DCP)	491	580
Silver (thousand troy ounces)	1,492	2,535	Nitrogen		
Potash	662	625	Urea	511	628
Ferroalloys	451	436	Ammonia	508	619
Copper	207	302	Nitric acid	454	468
Palladium (thousand troy ounces)	60	248	Ammonium nitrate	447	458
Nickel	179	242			
Gold (thousand troy ounces)	42	182			
Platinum (thousand troy ounces)	35	174			

¹ Volumes from affiliated companies are not included.

Vale recognizes, in this report, that there is still a lot of work to be done to achieve the results expected by society

Multiplying value

In 2011, Vale's investments, not including acquisitions, amounted to US\$18 billion, a significant rise of 42% on the US\$12.7 billion invested in 2010, although below the amount budgeted, due to project execution obstacles.

Of the total invested, US\$11.7 billion was allocated to developing projects, US\$1.7 billion to research and development, and US\$4.6 billion to sustaining existing operations.

Social and environmental spending came to US\$1.5 billion, composed of US\$1 billion in environmental protection and US\$457 million in social projects.

Five projects were delivered in 2011: Onça Puma, the first ferronickel operation in Brazil; two pelletizing plants and a distribution center in the Sohar Industrial Zone in Oman; Moatize in Tete Province, Mozambique, Vale's first greenfield coal project, and the company's first project in Africa; and two hydroelectric plants, one in Karebbe, Indonesia and the other in Estreito, Brazil.

These economic results demonstrate the company's competence at transforming resources into prosperity. Throughout this report, Vale recognizes that a lot of work lies ahead. The positioning shows that the company is committed to transforming realities, sharing value and promoting a sustainable development agenda in all of the regions where it operates.

Vale takes this stance because it believes that, by directing its efforts to closely following its new Mission, Vision and Values, it will be possible to attain the results expected by society. Vale invites readers to use the channels available and to participate in this collective process of building its vision of being the number one global natural resources company in creating long term value, through excellence and passion for people and the planet.

GRI Reference

Indicator: EC1

Profile: 2.7



+ online content More information about the topics covered in this chapter can be found in the online version of the 2011 Sustainability Report www.vale.com/rs2011

Credits

General coordination
Sustainable Development
Department

Editorial support
Corporate Communication
Department

Operational support
CSC Computer Sciences Brasil S.A.

External assurance
KPMG

GRI consultancy and text
Report Sustentabilidade

Proofreading
Assertiva Produções Editoriais

Translation
Batata Comunicações
Mark Beresford

Graphic design and print production
Report Sustentabilidade

Front cover
Marcio Dantas Valença

Typefaces
PMN Caecilia
Peter Matthias Noordzij, 1990
Myriad PRO
Robert Slimbach and Carol Twombly, 1992

Photographs

Agência Na Lata pp. 10–11, 24–25, 32
Anísio Eduardo Silva p. 91
Andreza dos Santos Ribeiro p. 96
Aris Prio Ambodo p. 89
Cícera Marinheiro Santos p. 57
Dario Zalis p. 53
Edu Simões pp. 102–103
Eduardo Perini p. 65
Felipe Duarte p. 94
Flávio Santos p. 107
Francisco Antonio da C. Souza p. 55
Glen Watson p. 95
Gunawan Nading p. 77
Ilzon Antônio Climaco p. 91
James Hodgins p. 46
João Marcos Rosa / Nitro pp. 85, 93
Leonardo Ferreira pp. 22, 40, 42, 109
Laura Peiter p. 58
Lídice Oliveira p. 55
Lucas Lenci pp. 21, 27, 105
Lucas Pupo p. 39
Luciana Tancredo p. 13
Octávio Cardoso pp. 60–61, 74
Olegário Reis Júnior pp. 79, 100
Paul Davies p. 99
Pedro Paiva p. 72
Ricardo Ortiz p. 110
Rosivaldo de Assis V. da Silva p. 81
Vantoen Pereira Jr. pp. 3, 6, 112



