Carajás S11D Iron Project

A new impetus to Brazil's sustainable development

VALE

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Overview

The aim of this Vale publication is to present the Carajás S11D Iron project to society.

The project represents an expansion in iron ore mining and processing at the Carajás Mining Complex, which began operating in 1985. Since then, not only has the complex produced the best quality iron ore in the world, supplying the Brazilian and international market, but Vale's presence in the municipalities of Parauapebas and Canaã dos Carajás in southeast Pará has underpinned a strong cycle of economic and social development in Brazil's North region, with equally important benefits for environmental preservation.

Using the experience it has gained in Carajás, and based on projections concerning the mining complex's expansion, this publication intends to show society the S11D project's key role in a new cycle of sustainable development in the states of Pará and Maranhão – where is located the Ponta da Madeira port terminal – and in the continuation of Brazil's position as a major player in the global iron ore market.

The quantitative data about the S11D project contained in this publication are estimates and should be considered as such.

June 2012

Contents

Vale's archive

Carajás Mining Complex

Expansion of Ponta da Madeira Port Terminal

Vale's archive

Construction of Canaã dos Carajás Municipal Highway

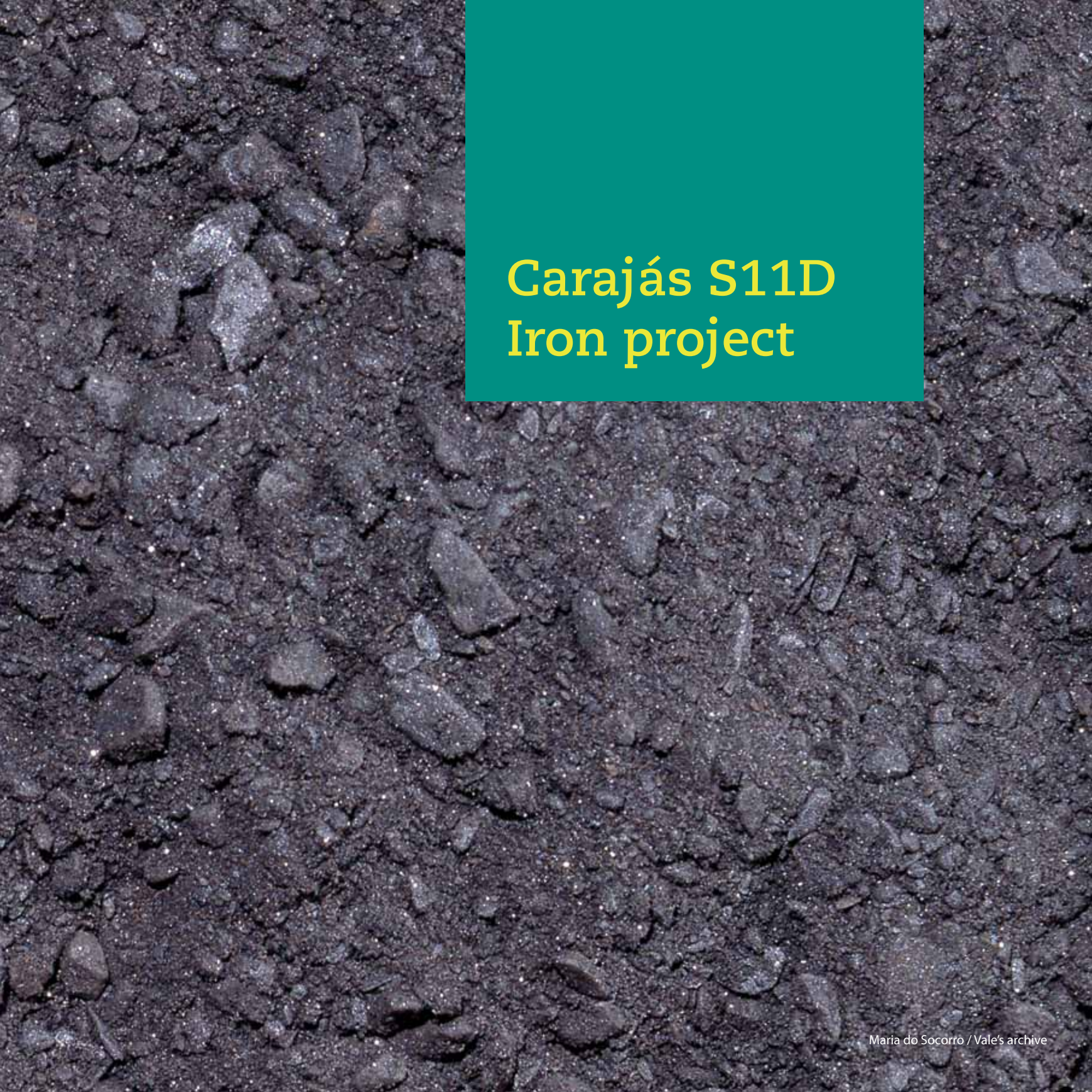
Salviano Machado / Vale's archive

Construction of Southeastern branch of Pará Railroad

101 Km

- Carajás Mining Complex
- S11D
- Carajás Railroad
- Highway

Carajás S11D Iron project



Maria do Socorro / Vale's archive

A new cycle of development

Economic, social and environmental benefits seen in Carajás since 1985 attest to the transformational potential of Vale's new project

A project of enormous dimensions, which will represent the largest volume of private investment in Brazil this decade, promises to give a new boost to economic and social development in the states of Pará and Maranhão while also contributing to environmental preservation in the Amazon biome. This is the Carajás S11D Iron project, which as of 2016, once an operating license has been obtained and the implementation schedule has been confirmed, will increase the amount of iron ore extracted from the Carajás Mining Complex, in southeast Pará.

Vale arrived there at the start of the 1980s, when the idea of extracting mineral resources from the ground in a forested area seemed unusual. Over the last three decades, the operation has been successful, helping to improve the lives of people in surrounding areas, strengthening the Brazilian economy and limiting the expansion of predatory cattle raising. From the start of that long-ago "adventure," which began with annual production of 1 million metric tons of iron ore and a semi-industrial processing plant, until 2011, when record output of 109.8 million metric tons was achieved, Vale has experienced various challenges and learned many things in the region.

Firstly, it has learned to manage the social impacts that an undertaking of this size represents for the municipalities involved. While exponentially expanding the supply of jobs and people's level of income, such projects also induce inflows of people that can cause problems for an unprepared area. As a result, the company is investing in

relationships with local communities and social initiatives, through the Vale Foundation (see details on page 36), and is developing infrastructure, manpower training, and entrepreneurship projects in the region.

In the environmental field, one cannot be too careful when operating in an environment of inestimable value to Brazil and the world. Vale's commitment to respect the environment has motivated direct investment in areas owned by the company and on public land, contributing now to preserving more than 8,000 km^2, half in Carajás National Forest, which has given up just 3% of its area to make way for the mining complex (see details on page 28).

In turn, the company's experience in Carajás has permitted the development of production and logistics technologies that will greatly reduce the environmental impact of future projects, in terms of natural resources used and the emission of pollutants. When they are operating, the S11D project's mine and plant will use 93% less water and 77% less fuel, and will produce 50% less greenhouse gas emissions, when compared with conventional methods. The new mining area will also be more efficient in terms of electrical power consumption (see details on page 44).

Simulations of S11D Carajás Iron project

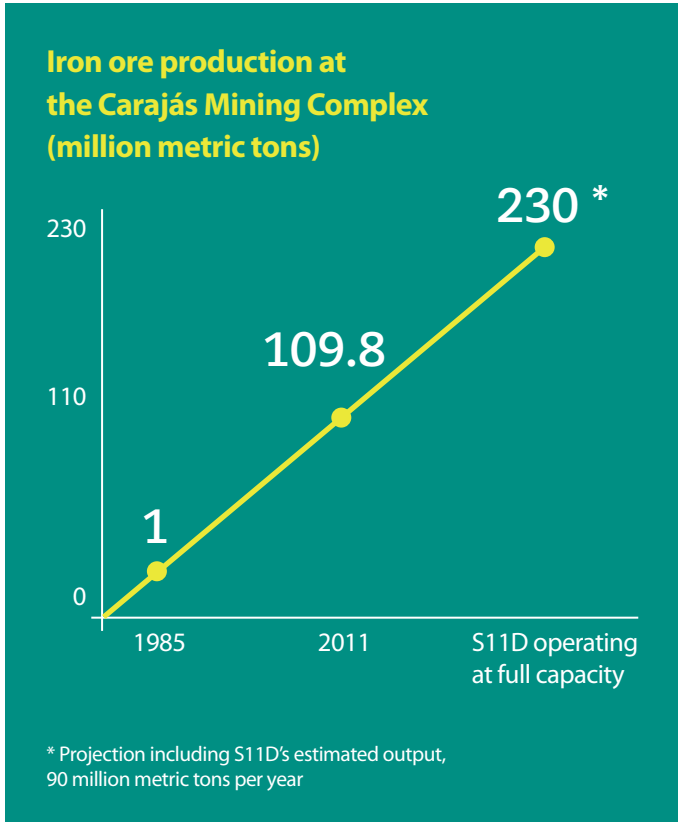
Carajás represented a step change for the economy of southeast Pará. The municipality of Parauapebas, for example, has become the leading exporter among all Brazilian municipalities, with higher tax revenues arising from economic activities generated from mining, and more high-quality jobs. Similar developments, although on a smaller scale, have occurred along the Carajás Railroad and in São Luís in Maranhão, where the ore is shipped abroad. The S11D project promises a new cycle of development, generating 30,000 workers will be employed - at the peak of construction work – in the states of Pará and Maranhão. This number includes all the workers needed for the implementation of the plant, the expansion of the railway and of the Ponta da Madeira Port Terminal. (see details on page 17).

Strategic project for Vale and Brazil

At the moment, Vale is simultaneously operating four open-pit iron mines in Carajás, and has another one in the opening phase. The complex is the biggest producer of iron ore in the world, making a product with high iron content (around 66%) and low concentrations of impurities.

S11D will supply 90 million metric tons of iron ore per year. When it has reached full capacity, Vale's total ore production in Pará should reach 230 million metric tons per year.

This ore will meet growing global demand generated by rising investment in construction and the production of machines, equipment, aircraft, cell phones and other essential everyday products that contain iron.



The new mine, together with other projects planned in the region, will put southeast Pará on the same level as the Iron Quadrangle region in the state of Minas Gerais. The S11D project will also enable Vale to maintain its leading position in the global iron ore market.

The project was named for its location (ore body S11, block D). The mining potential of ore body S11 is 10 billion metric tons of iron ore, and block D on its own contains 2.78 billion metric tons of reserves to be mined by Vale.

Simulation of S11D Carajás Iron project

The result of five years of environmental and engineering studies, and with technical teams from Brazil, Canada and Australia involved in developing the project, the S11D incorporates all of the lessons Vale has learned mining in Carajás. It also follows the company's Sustainable Development Policy, which is aligned with global initiatives such as the United Nations Global Compact, the International Council on Mining and Metals (ICMM) and the Global Forum on Mining Industry Sustainability. One of the outcomes of these guidelines was the decision to build the processing plant and all other industrial facilities on pasture land outside the Carajás National Forest.

Salviano Machado / Vale's archive

S11D project investment profile

Mine and plant	US$ 8.04 billion
Logistics infrastructure	US$ 11.45 billion
Total	US$ 19.49 billion

Around US$20 billion will be invested – US$8 billion in installing the new mine and processing plant, and the remainder in logistics infrastructure.

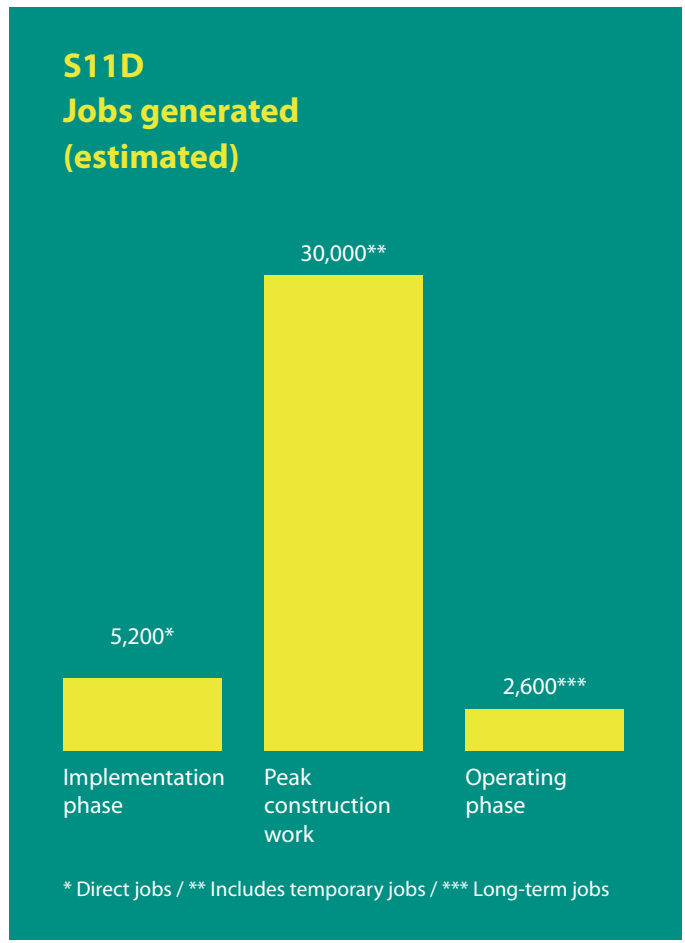
S11D project schedule (expected)

Period	Status	Activities
June 2012	Obtain preliminary license	Execution of infrastructure works and equipment purchase
By the start of 2013	Obtain construction license	Start-up of processing plant construction
Second half of 2016	Completion of work	Start-up of mine and processing plant

S11D is expected to begin operating in 2016, resulting in the creation of another 2,600 long-term jobs in the region

After being extracted in the open-pit mine, the ore will be transported to the processing plant using conveyor belts. Ore processing will use the environment's natural moisture, eliminating the use of water at this stage. The product will then be transported along a new 101-km branch line to the Carajás Railroad (known by Portuguese acronym EFC). The EFC, in turn, will be widened along a 504-km stretch, transporting the ore to the Ponta da Madeira Port Terminal, whose capacity is also being expanded.

As of June 2012, around 30% of the basic infrastructure work has been completed, involving an investment of US$1.2 billion in such access roads, employee facilities, equipment and metallic structures. Once the construction license has been granted, implementation of the project will take three years, during which time 30,000 workers will be employed - at the peak of construction work – in the states of Pará and Maranhão. This number includes all the workers needed for the implementation of the plant, the expansion of the railway and of the Ponta da Madeira Port Terminal. S11D is expected to start up in 2016, creating a further 2,600 long-term jobs in the region.



Knowledge Station, Tucumã, Pará

Economic Development

Christian Knepper / Vale's archive

More prosperity to share

Vale's new project in Carajás will induce regional development in Pará and Maranhão, as well as contribute to Brazil's trade balance

S11D will inject US$19.49 billion of investments into the economy, as well as generate more than 30,000 direct jobs during the implementation phase and raising Brazilian exports.

The project will spur a new cycle of development in the region, contributing to expansion in the production chain in the states of Pará and Maranhão, with multiplier effects on income, the job market, tax revenue and the business environment in general. Vale is confident of the initiative's success, based on the lessons it has learned while operating for more than 30 years in Brazil's North region.

By implementing S11D, Vale will be strengthening its position as a global leader in the mining industry. The project will upgrade the region's railroad and port infrastructure, with positive consequences for the whole country's logistics efficiency and competiveness. When it reaches full production in 2016, the project will produce 90 million metric tons of iron ore per year, only slightly less than Carajás Mine's current output, achieved after three decades of expanding operations.

S11D's impact on international trade is a good measure of its importance to Brazil's economy. In 2011, iron ore worth US$41.8 billion was exported from Brazil, accounting for 95% of the country's total mineral exports and 16.33% of its total exports. Vale was responsible for around 80% of these sales. The North region alone accounted for 29.5% of Brazil's iron ore exports last year.

Development of local suppliers is strategic

Hiring local suppliers is a strategy of Vale's to stimulate and improve the economy in the regions where it operates, qualifying and developing partner companies aligned with its concepts of sustainable business.

S11D will be no different. The project will incorporate the supplier qualification and training programs that Vale uses in various municipalities in partnership with society and government. These involve capacity building, the supply of credit lines, encouragement for business deals, and the provision of more favorable conditions for the acquisition of goods and services.

One of the main initiatives in this area is the Supplier Development Program, which is designed to raise the capacity of regional production chains to supply inputs and services in line with the technical needs of Vale's projects.

The Supplier Development Program fosters economic development in projects' areas of influence, improving competitiveness, helping companies to adapt and grow, and generating jobs and income for local people.

Meanwhile, the Manpower Training Program aims to fulfill one of Vale's most important commitments, which is to prioritize local workers, both during the implementation phase and when projects are operating.

Through this program, Vale trains local suppliers of goods and services in partnership with specialist institutions such as SESI, a nonprofit social organization for industrial workers, thereby generating jobs and income for local communities.

It is estimated that S11D will generate more than 200 new business opportunities, based on the programs to stimulate local purchasing that Vale has already implemented at its operations across the world. The project will create a range of business opportunities for micro and small enterprises in Pará and Maranhão, both directly by purchasing goods and services in the local supply chain, and indirectly through the multiplier effect.

Dario Zalis / Vale's archive

Diversified investments

The Carajás region is one of the biggest mineral provinces in the world, containing large deposits of iron ore, manganese, copper, nickel and gold. Growing dynamism of the region's economy will be one of the main and most visible positive impacts of the S11D project, not just in the area that will host the mine and plant, but also in the state of Pará as a whole, around the port in Maranhão that will export the ore, and along the Carajás Railroad, which crosses both states.

Of total budgeted investment of US$19.49 billion, the majority (US$11.45 billion) will be in logistics (railroad and port), and the rest in the mine and plant.

As of June 2012, US$1.2 billion had already been invested in building basic infrastructure such as access roads and facilities for employees – a parallel activity to the licensing process. To implement S11D, besides investing in the mine and processing plant, Vale will build associated transport infrastructure. This includes a new road, a new branch railroad line in southeast Pará connecting the plant to the Carajás Railroad, and expansion of both the railroad and Ponta da Madeira Port Terminal in São Luís, Maranhão.

Investment in logistics and technology will guarantee operational efficiency, growth and sustainability. They will also enhance the competitiveness of Brazil as a whole.

Lucas Lenci / Vale's archive

Key figures about the S11D project

R$ 228 million

invested by the end of 2011, hiring services in areas such as electrical maintenance, predictive maintenance, information technology, and the building of a conveyor belt workshop.

R$ 1.6 billion

estimated spending on contractors by 2016.

R$ 3 billion

spent on purchases by 2016.

Antonio de Jesus do Nascimento / Vale's archive

to the region and maintain a relationship of trust with local entrepreneurs, a program called "Sala de Negócios" ("Business Room") is already being developed. This is a space organized by Vale where the company presents opportunities for new business and the strengthening of the local economy. This includes training entrepreneurs and helping them to bring their businesses into the formal economy. The Carajás S11D Iron project brings together Vale's experience in efficient ore production with the 21st century's most modern technological concepts, in order to guarantee a balance between economic, social and environmental results.

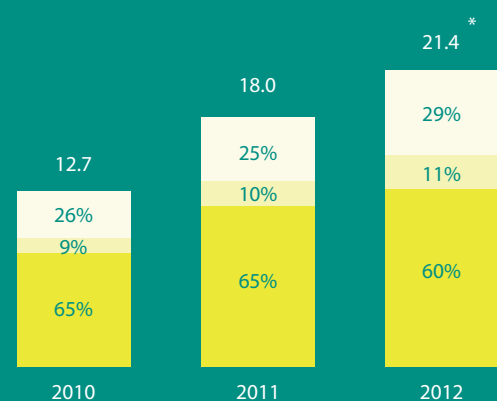
Opportunities in the supply chain

Implementing and operating the Carajás S11D Iron project will create many opportunities throughout its production chain. These opportunities begin with an expansion in people's income (salary payments and wealth generated by direct, indirect and induced purchases) and local employment, and then lead to higher tax revenues.

The new activities and production resulting from cascading effects in the local economy will expand the regional economy. For example, local business people will be stimulated to supply goods and services to meet demand from Vale and its workers, suppliers and customers.

To facilitate the positive agenda surrounding the development opportunities that S11D can bring

Vale's investment profile
Investments by type (US$ billion)



Transformation during more than three decades of Vale's activities in the region

The S11D project incorporates the lessons learned during the more than 30 years that Vale has been contributing to the development of the North region, strongly believing in its mining potential.

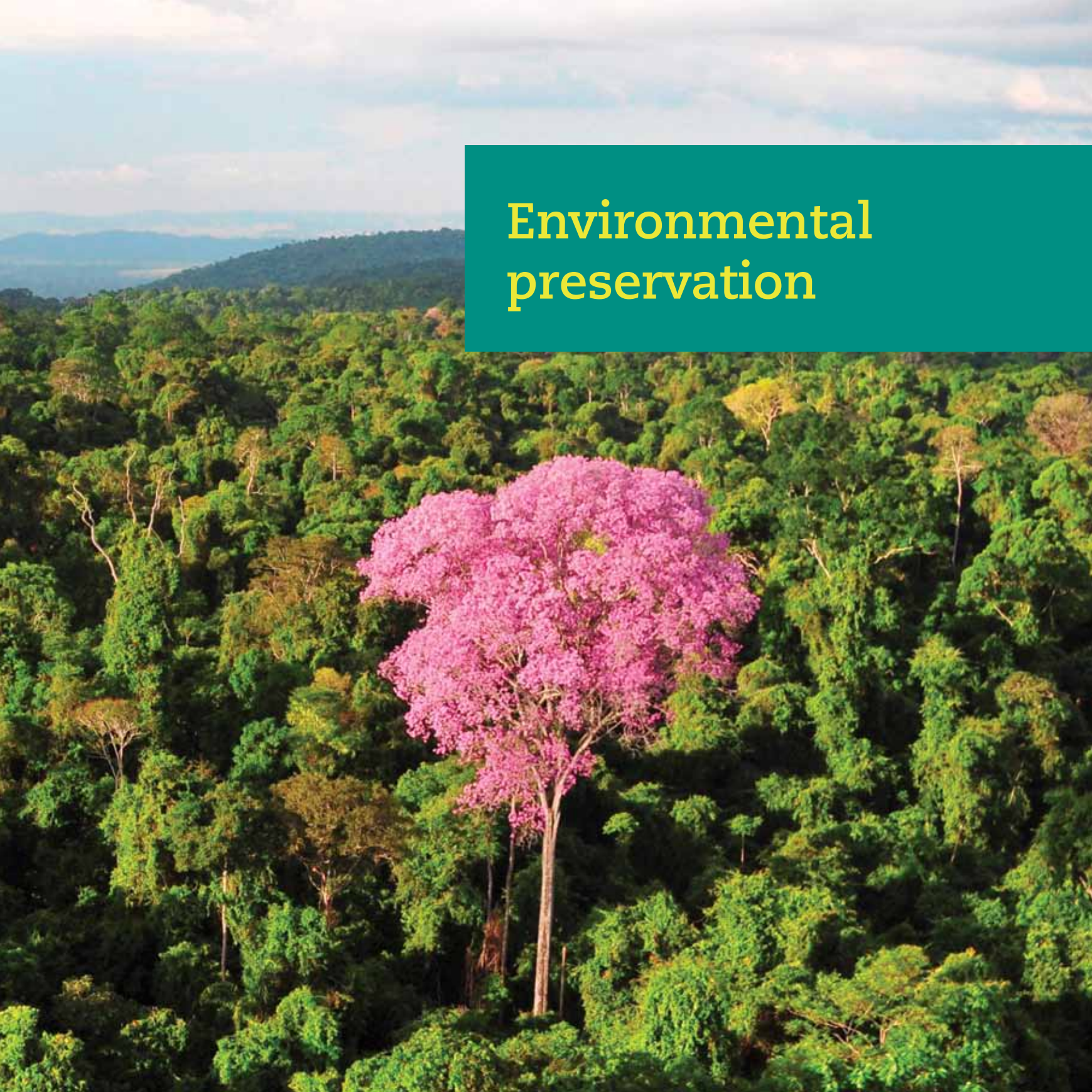
The municipality of Parauapebas in Pará is home to the Carajás Mineral Province, the biggest producer of iron ore in operation in the world. Carajás encompasses four open-pit mines being operated simultaneously by Vale – N4E, N4W, N5E and N5W – as well as a mine in the opening phase, N5S.

Pará is also the starting point of the longest passenger railroad in Brazil, the Carajás Railroad, which extends 892 km through 25 municipalities until it reaches São Luís in Maranhão. The passenger train carries around 1,100 people per trip between the two states. The same route is taken by the longest freight train in the world, which has 330 railroad cars. Besides iron ore, this train transports manganese, pig iron, copper and other types of goods such as soy and fuels.

Vale's operations in Pará employ many people. Including employees, long-term contractors and short-term project contractors, 19% of the 187,700 people employed by Vale in 2011 lived in the state. Neighboring Maranhão accounts for a further 18% of Vale's workforce, or 33,800 people. These figures do not include another 9,000 jobs in projects in the region that are at the implementation phase, and the job opportunities that the company's projects generate indirectly.

Vale's activities make Parauapebas, in Pará, the biggest exporter in Brazil. According to official figures from the Ministry of Development, Industry and Foreign Trade, in 2011 Parauapebas topped the ranking with exports of US$11.728 billion, followed by Angra dos Reis (Rio de Janeiro) with US$10.877 billion, Nova Lima (Minas Gerais) with US$4.579 billion, Anchieta (Espírito Santo) with US$4.158 billion, and Santos (São Paulo) with US$3.519 billion. Together, these municipalities' combined exports in 2011 were US$34.861 billion, more than Brazil's trade surplus of US$29.790 billion.

Eduardo Perini / Vale's archive



Environmental preservation

Past, present and future

Over the years, Vale has developed technologies and management systems that have led to lower-impact operations

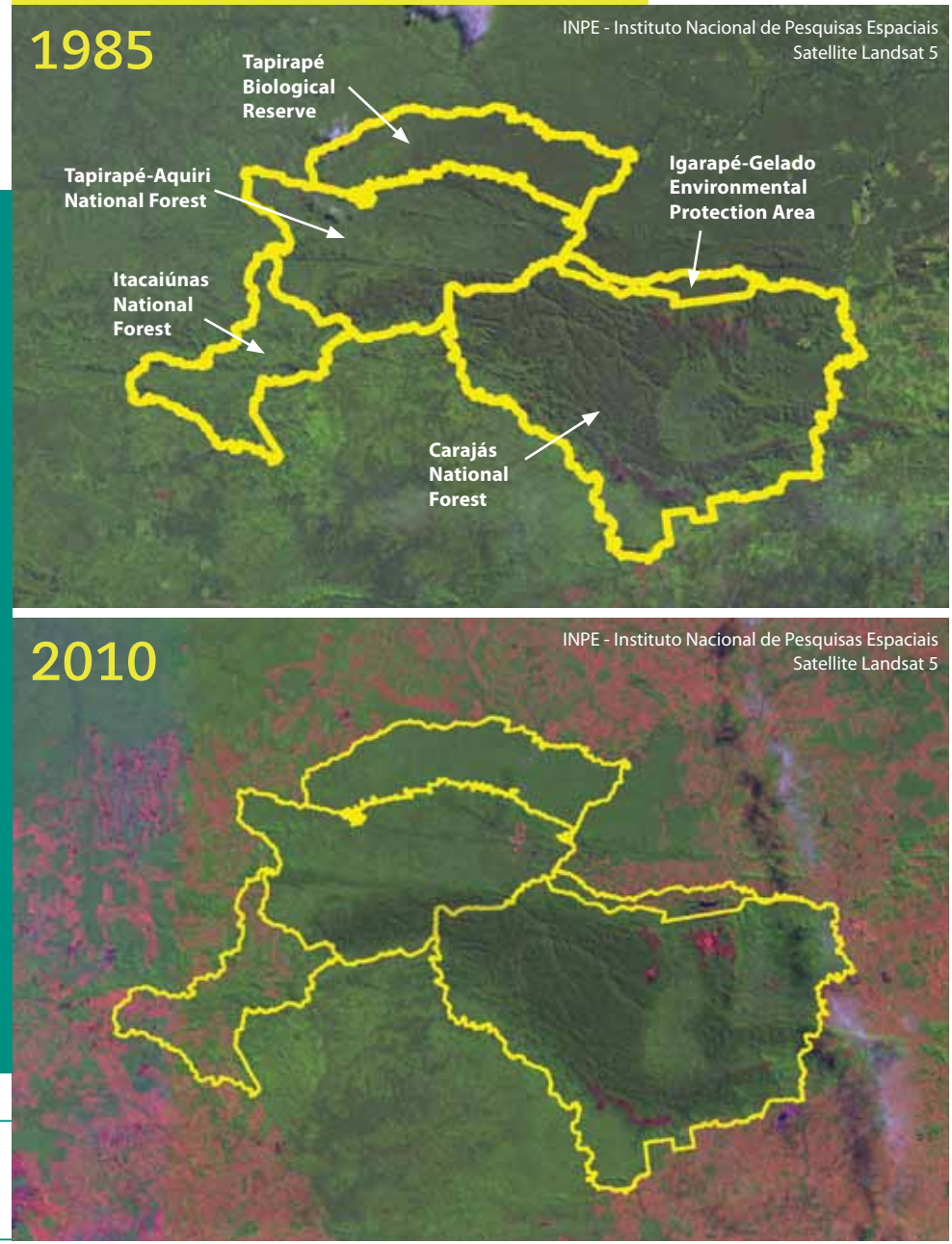
Contrary to what many people think, mining can contribute to environmental preservation. This is what Vale's presence in southeast Pará demonstrates. Since it began mining iron ore in the region in 1985, the company has been helping to conserve Carajás National Forest and other areas of the Amazon biome in partnership with the Chico Mendes Institute for Biodiversity Conservation (ICMBio). Over the years, Vale has also developed technologies and management systems that have led to lower-impact operations.

All of this experience gained over more than 30 years is incorporated into the S11D project, which has been carefully planned to achieve operational excellence.

Carajás National Forest, which is home to a number of Vale's iron, manganese and copper mines, as well as S11D, is a Conservation Unit created in 1998 by presidential decree, and whose objectives include "the sustainable exploration of natural resources" such as mining. Vale's operations occupy just 3% of Carajás National Forest's area of approximately 4,120 km^2.
In addition, Vale's support has been fundamental in preventing cattle raising and logging from encroaching on the region's forests. Aerial images show a landscape dominated by pasture land and other deforested areas outside the boundaries of the Carajás Region Mosaic of Conservation Units. Carajás National Forest and four adjacent areas covering a total of 4,559.5 km^2 together make up this Mosaic (see the table on page 32). The Mosaic is protected through a partnership between Vale and ICMBio, which conducts monitoring, research, fire prevention, firefighting and environmental education activities (see chart on page 33).

In addition, the Vale Fund for Sustainable Development runs projects, in partnership with public institutions and

Satellite image of multiple Conservation Units in the Carajás region



The area highlighted in yellow on the map indicates the Carajás Region Mosaic of Conservation Units, which covers 8,679 km². Vale's activities occupy just 3% of Carajás National Forest's area. The company helps to protect the units that make up the Mosaic in partnership with the Chico Mendes Institute for Biodiversity Conservation (ICMBio).

Comparing the satellite images from 1985 and 2010 shows the importance of the protective work undertaken in the Carajás region to preserve the Amazon Rainforest.

- Area of forest
- Area changed by mankind / deforested

Lucas Pupo / Vale's archive

third sector organizations, that contributed to a 40% reduction in the deforestation rate in the Amazon region between 2009 and 2011.

This participation by Vale in preserving the Amazon biome is just a sample of what the company is doing around the planet, as it is present in various parts of the world with significant old-growth forest reserves. The company protects or helps to protect an area 3.5 times larger than that occupied by its global operations, adding up to 13,700 km^2 of natural habitat.

In 2011, Vale invested US$1.030 billion in environmental monitoring and protection, 40% up on the previous year.

Innovative solutions

In the S11D project, Vale's concern to reduce environmental impacts starts with the location chosen for the iron ore processing plant: it will be built in an area already affected by mankind outside Carajás National Forest, thereby avoiding the need for deforestation.

Likewise, in order to minimize its impact on the forest, 70% of the railroad branch line that will transport ore to the Carajás Railroad will also be built on pasture land. Along the stretch within the Conservation Unit, a tunnel and bridge will be built to avoid direct impacts on vegetation and fauna, involving an additional investment of R$200 million. Once in operation, S11D will follow various procedures designed to minimize its environmental impacts.

In line with Vale's strategic commitment to "reduce its demand for new water in operations, using new or existing technologies," ore processing will use the environment's natural moisture, enabling a 93% reduction in water consumption compared with the conventional process, which requires intensive use of the resource. Furthermore, 86% of the water extracted at Vale's facilities will be reused.

Another global Vale commitment affecting the project is to reduce its projected 2020 greenhouse gas emissions by 5%. Three measures will contribute to achieving this target. The most important is the use of a "truckless" system of 37 km of conveyor belts to transport ore from the mine to the plant. Avoiding the use of trucks will not only cut the amount of waste, such tires, filters and lubricants, but will also reduce diesel consumption by 77%.

Reduction in environmental impact

77% reduction in the use of fuel*

18,000 MW

of electricity is saved every year in Carajás by using new ore processing technology*

3% of Carajás National Forest is occupied by the mining complex

5.2 million metric tons

of iron ore ultrafines, previously considered a waste product, have so far been reprocessed thanks to a system developed by Vale

* Compared with the conventional method used at mines and plants


Dario Zalis / Vale's archive

If compared with conventional systems, truckless transportation and ore processing using natural moisture will cut greenhouse gas emissions by 50%, or 118,000 metric tons of CO_2 equivalent per year.

In turn, S11D's main equipment will be powered by electricity. Only crawler tractors, motor graders and other auxiliary machines will continue to run on diesel.

Carajás Region Mosaic of Conservation Areas – composition

Unit	Area (km²)
Carajás National Forest	4,119.5
Tapirapé-Aquiri National Forest	1,900.0
Itacaiúnas National Forest	1,414.0
Tapirapé Biological Reserve	1,030.0
Igarapé do Gelado Environmental Protection Area	216.0
Total	8,679.5


João Marcos Rosa / Vale's archive

System to help prevent forest fires

Since 2007, Vale and the Chico Mendes Institute for Biodiversity Conservation (ICMBio) have been working to prevent forest fires in the Carajás Region Mosaic of Conservation Units. The Fire Detection System differs from other similar monitoring systems in that it reclassifies satellite information provided by the Brazilian space research agency, INPE, cross-checking it with data on land use, vegetation cover, topography and weather (such as temperature, wind speed and air humidity). By superimposing this information, the system produces a Dynamic Fire Susceptibility Map, which indicates whether a fire is in an area of low, medium or high environmental sensitivity.

Besides monitoring sources of heat, the Fire Detection System enables field operation logistical support maps and statistical reports to be produced, facilitating the work of firefighters by showing the location of highways and access tracks close to the identified source of a fire.

During the dry season, from June to November, Vale and ICMBio run a campaign to prevent and combat forest fires. This initiative features educational and prevention-oriented talks, the use of billboards and the distribution of informative material in communities close to environmental preservation areas.

Antonio de Jesus do Nascimento / Vale's archive

Social benefits

Leaving a positive legacy

Dialogue with local communities, respect for traditional cultures and diagnostic studies form the basis of Vale's stance on social responsibility in the Carajás region.

The southeastern region of Pará state has experienced strong economic and demographic growth since the development of the Carajás mining complex began in the 1980s.

Strong growth in income and jobs attracted many migrant workers, which put public services, housing and other amenities under other strain.

Aware of these knock-on effects, Vale has sought to contribute to improvements in infrastructure in the region, strengthening its relations with local communities in order to identify the needs and potential of each region.

The impact of large mining projects on the socio-economic development of the municipalities receiving them can be ascertained in data presented by the Firjan Municipal Development Index (IDFM), an annual study that tracks the evolution of Brazil's 5,564 municipalities in three areas: employment and income, education and health.

Parauapebas and Ourilândia do Norte, each of which hosts Vale operations, hold second and third places in the 2011 IFDM ranking for Pará state (base year 2009), with only state capital Belém ahead in the reckonings.

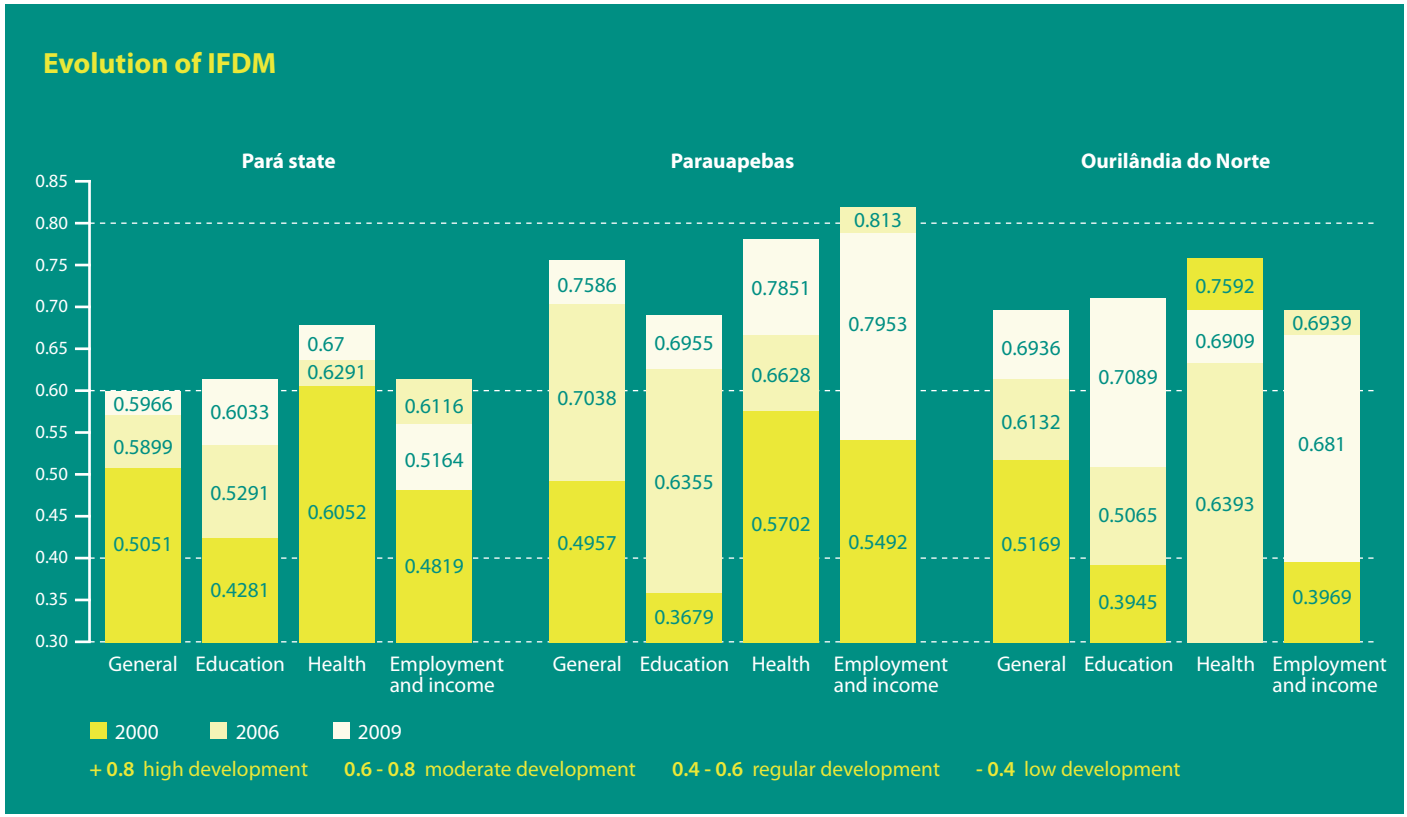
In all three categories, the indicators for the two minining towns were above the state average (see chart). A comparison between the data for 2000 and 2009 shows that Parauapebas and Ourilândia do Norte achieved rapid advances in employment and income, education and health.

On the issue of education, in particular, Parauapebas showed an improvement in its development rate over the last decade. This advance was also registered by the Brazilian Institute of Geography and Statistics (IGBE). According to the

2010 Census by this organization, the illiteracy rate in the district has been halved since the 2000 Census, falling from 16.3% to 8.1% in the respective IBGE studies.

The difference between municipalities hosting the mining projects and those that do not can also be clearly seen from by considering wealth generation alone. Once the operations phase is reached, average wages are up to five times higher than the prevailing average in the formal economy. According to the 2010 Census, the two municipalities with the highest GDP per capita in the state of Pará in 2008 were Canaã dos Carajás (R$ 48,639.03) and Parauapebas (R$ 45,225.41).

With the S11D project, Vale believes that the wider benefits are even greater. A proportion of the contingent of professionals expected to work in the implementation and operational phases of the project are already benefitting from Vale's long-term investments in training workers and raising skill levels in the local workforce, with some six thousand people to be qualified under this scheme by 2013. Courses for electricians, industrial painters,



mechanical assembly workers, metalworkers, carpenters, stonemasons are among those on offer.

To provide living quarters for employees who work in project implementation, and adding to the existing hotel infrastructure in Canaã dos Carajás, three large accommodation bases are being built. One has been built together with the Vale Support Installations, located six kilometres from thee town of Canaã, southeast Pará, with space for up to 3,500 employees. The other two lodges will be built next to the future plant that forms part of the development, 40 kilometers from Canaã, and may be dismantled at the end of the deployment phase. Vale also plans to build two accommodation bases for employees who are mobilized for the operational phase. This accommodation will have an administrative area, laundries, kitchens, dining areas, shops, a recreational area and an ecumenical center.

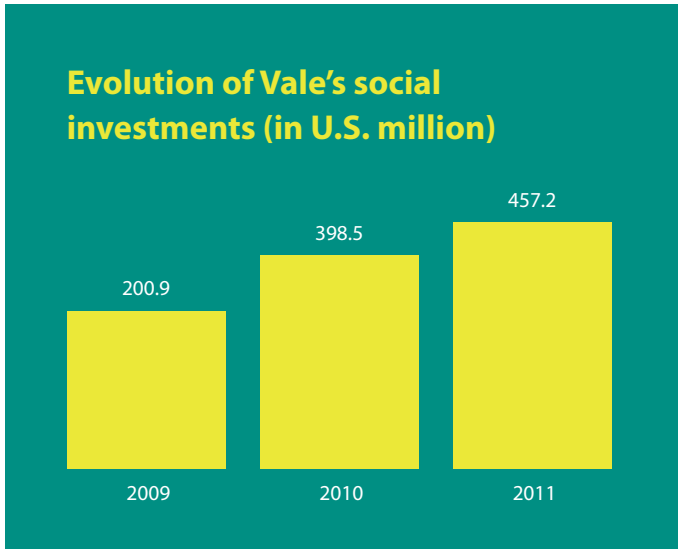
Study guides social actions

In 2006, the Vale Foundation conducted a regional diagnostic study, updated in 2010, covering the municipalities of Marabá, Eldorado dos Carajás, Curionópolis, Parauapebas, Canaã dos Carajás, Ourilândia do Norte and Tucumã.

This study evaluated a number of statistical variations and examined projected impacts stemming from the expansion of the company, based on its own investment plan for 2006-2010. Finally, the study included an analysis of local government capacity to sustain these investments through their own tax revenues. The results of this study showed that the Vale investment plan represented a feasible route for human and economic development and for improving local living conditions.

Vale-backed Schools Program, Canaã dos Carajás

Edu Simões / Vale's archive



The study was widely disseminated and nearly one hundred presentations on its content were given to an audience made up in equal proportions by members of the local community and mining industry employees. This work has engendered action plans to guide investments in health, safety, education, income generation, infrastructure and preservation of ethnic and cultural diversity.

One such investment is the Knowledge Station for the Environmental Protection Area of Igarapé Gelado, which opened em 2010. Built in a rural village, it provides support activities for 120 farming families in the region.

Advanced Support Groups were created for rural farming families who are organized into working units to develop methods for managing dairy farming, poultry farming and horticultural production. Additionally, a dairy processing industry is being installed to process the milk supplied by regional producers and also to market the dairy products.

The Knowledge Station also offers professionalizing courses, such as carpentry and other skills relevant to the civil construction industry, plus cultural and sporting activities. In turn, children from the region now attend the Professor Jorge Amado Municipal School that functions

within the Station and groups together five multigrade schools that used to be spread over a wider radius of up to 30 km away from each other.

The activities of the Vale Volunteer Program, in turn, complement the work of the company in the region through blood donation schemes, educational activities, lectures about drug abuse and violence, assistance to victims of disasters, environmental protection campaigns, construction work and home improvements.

The program has five committees in Pará, which together coordinated 24 activities in 2011 alone. In Parauapebas, a campaign to collect donations of food and clothing provided assistance to over 700 people who were displaced by heavy summer rains. In the same city, the Child Action program provided orthodontic care and distributed food and toys for three thousand children. In Canaã dos Carajás, there was a collective effort to restore the riverine forest vegetation at the city's water treatment plant, which resulted in the planting of one thousand saplings.

Partnerships against the sexual exploitation of children and adolescents

Two actions in 2011 helped to reaffirm the commitment of Vale to raising awareness, promoting and protecting human rights, with special attention to the rights of children and adolescents.

The first consisted of workshops and lectures to raise awareness of workers and communities near the Salobo Project, with the theme of preventing the sexual exploitation of children. The initiative was the result of a partnership between contractors, the town of Paraupebas (PA) and civil society organizations.

The other initiative was the Program for Sexual Education and Health Promotion in Maranhão. Through a partnership with the NGO Workshop of Images, lectures were held on the theme, attracting the participation of about 1,800 people in five municipalities of Maranhão. Short courses were also conducted on a monthly basis in the same towns, enabling 555 people on topics such as Sexual Rights and Prevention of Unwanted Pregnacy during adolesence. Participants also developed a communication plan and social mobilization plan for each of the municipalities.

Respect for indigenous culture

Vale pursues a relationship based on principles of ethno-development and recognizes the opportunity to enhance and preserve cultural identities. An example is the qualified dialogue and positive interaction the company has with indigenous communities living in locations near the Carajás Mining Complex.

Accordingly, actions are developed to prevent, mitigate or compensate for potential impacts on these populations.

In partnership with the National Indian Foundation (Funai) and the Protected Forest Association, Vale completed a Mobile Indian Support Center for Tucumã (PA) in 2011. The relevance of this is explained by the fact that the local community depends on the urban centers of Ourilândia do Norte and Tucumã to make purchases, receive pensions and for links to access the support of public systems (education, social welfare and health).

Another important action was the promotion of training with employees, including leaders and contractors' management, in order to interface with the Xikrin do Cateté indigenous community. The objective was to promote the alignment of the relationship that the company has developed with indigenous people, exposing the actions already underway or executed, as well as the impacts identified in the ethno-ecological studies.

Vale also has partnered with the Municipal Government of Parauapebas road for the improvement of the roads serving the indigenous community Xikrin do Cateté. A project providing a micro-system for the supply of water to the Indian village Oodjã is in its final stage.

Finally, in response to a request by inigenous leaders, Vale has supported the year-end festivities held in the period from 15 to 18 December, 2011, providing articles and sporting goods to the indigenous villages of Catetéand, Djudjêkô and Oodjã.

In 2011, actions of this kind benefited more than ten thousand people in Brazil, including eight different ethnic groups.

Benefitting from natural humidity

Innovation and technology

Vale's archive

The pursuit of operational excellence

The S11D project brings together the main technological and procedural innovations developed by Vale in recent years

Vale's experience of almost three decades in Carajás, combined with the use of cutting-edge technologies and efficient production systems, make the S11D project the closest there is to operational excellence in iron ore mining and processing. Its innovations guarantee a lower impact on the environment and surrounding communities as well as competitive production.

As at other mines in the Carajás Mining Complex, S11D will use the open-pit mining system. This system has a number of advantages over underground mining, such as lower production costs, ease of supervision, better working conditions and lower risks for workers.

Mining operations will not feature trucks, but rather a "truckless" system using in-pit crushing and conveying technology. If S11D were to use conventional mining techniques, around 100 off-highway trucks would be needed.

Once extracted from the ground, the iron ore will be collected by excavators and deposited in mobile crushers. The crushed ore will then be fed onto conveyor belts, which will take it to the processing plant. In all, there will be 37 km of conveyor belts distributed around the mining area, including branches that will connect to the main 9.5-km trunk line that in turn goes to the processing plant.

By using the conveyor belts, the system will achieve significant reductions in diesel oil consumption, particulate emissions and the generation of waste such as tires, filters and lubricants. In addition, using conveyor belts will enable the processing plant to be built on pasture land outside the forest.

In turn, ore processing will incorporate an innovative methodology developed by Vale, which uses the material's natural moisture to aid screening. This technology, already employed successfully on a smaller scale at the Carajás Mining Complex, will cut water consumption by 93% in comparison with the conventional process. This saving is equivalent to the water used by a city of more than 400,000 inhabitants (19.7 million m3 per year). Adopting this technology will also reduce electricity consumption by 18,000 MW per year. Another distinctive feature is the lack of a tailings pond, reducing the need to disrupt native habitat.

If compared with conventional systems, truckless transportation and ore processing using natural moisture will cut greenhouse gas emissions by 50%, or 118,000 metric tons of CO_2 equivalent per year.

All of the greenhouse gas emissions incorporated into the scope of Vale's emissions inventory were converted into metric tons of CO_2 equivalent in accordance with their specific global warming potential. The calculations were made in line with the GHG Protocol methodology.

Environmental and economic gains from reusing ore

An industrial-scale pioneering project developed by Vale may change mining systems across the world, extending the lifespan of reserves and reducing environmental impacts. This innovation entails the reuse of ultrafine iron ore particles, previously regarded as a mining waste product and deposited on piles of waste rock (mineral substances of no economic value) or in tailings ponds (artificial ponds used to store waste).

The new technology allows these ultrafines to be reprocessed, harnessing the iron ore contained in them and incorporating them into mineral products. As a result, the company has disproved the belief that it is only possible to mine ore once. Besides financial gains, the technique also lessens environmental impacts by reducing the area used for tailings ponds and waste rock piles.

In Carajás, Vale has so far reused 5.2 million metric tons of ultrafines deposited in tailings ponds following ore processing.

Assembly of first module in S11D project

Salviano Machado / Vale's archive

Enhanced safety for workers

The processing plant, including its administrative facilities, will be built using a module-based system. This involves assembling the project in modules, which may be built simultaneously out of the construction site and subsequently integrated. S11D will consist of a total of 114 modules.

Modularization is a safer option for workers, as it permits a better distribution of personnel over time and greater control of the assembly location. During construction, the modules can be tested and only then transported to their definitive location, where they will be connected and operated. The system also simplifies the requirements for foundations and cuts the implementation time, given that module assembly will take place simultaneously with earthmoving services and Vale's construction of a road to link the rural area with the urban center of Canaã dos Carajás.

Advanced control system

To help ensure that S11D is run efficiently, it will be integrated into the rest of the Carajás Mining Complex, which is supervised centrally from an operational control center. Opened in 2007, the control center uses telemetry to remotely monitor equipment's essential systems, and operates plants and dispatch facilities in real time using satellites.

From the control center, images of mining operations can be viewed at any production stage, and available data ranges from macro figures about a given area to the amount of material loaded into a crusher.

Using this advanced control system, it is possible to maximize synergies between mining, plant, dispatch and maintenance operations from a single location.

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