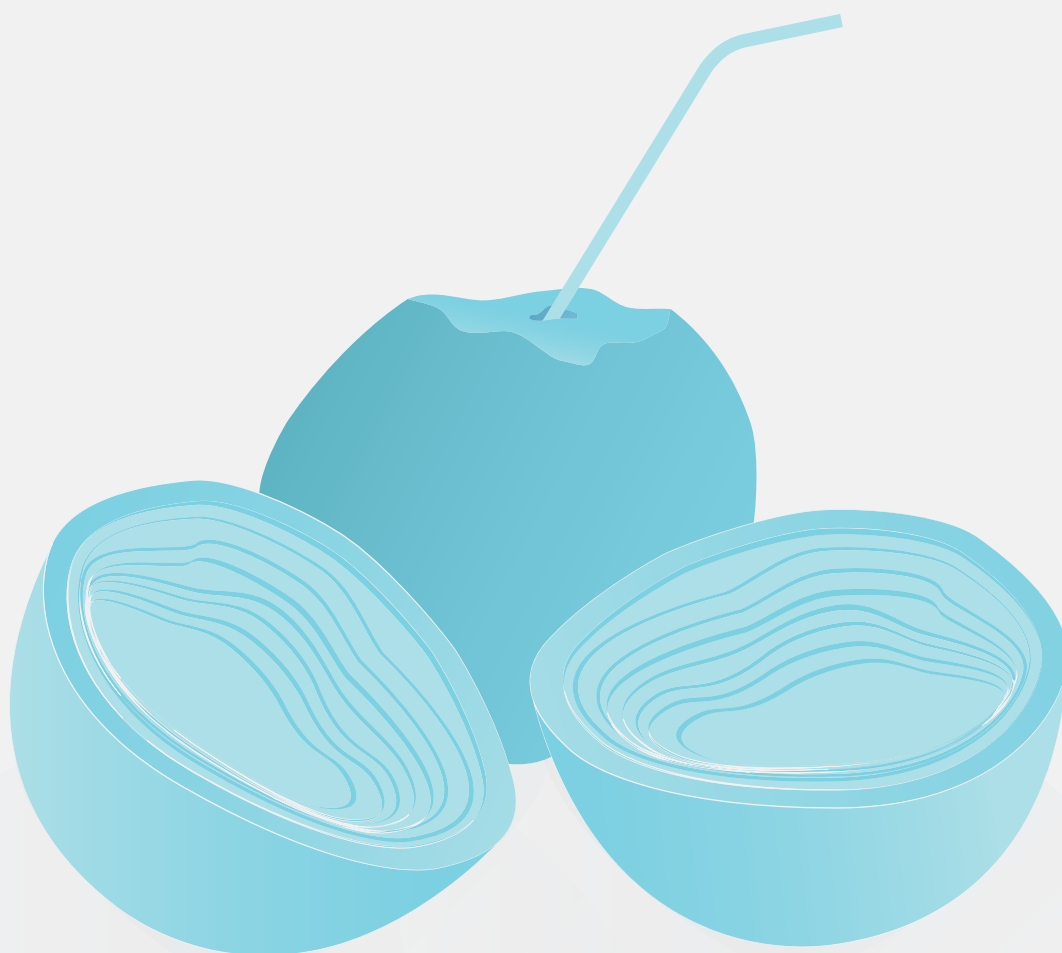


# GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS



## BRAZIL MINING 2013

*Economy - Mining Code - Exploration - Production - Services - Statistics*



# The main value is in the mine.

Alumina Rondon is the leading project of Votorantim Metais. Alumina Rondon is an integrated alumina refinery and bauxite mining venture in the state of Pará, in the North of Brazil, with potential to become the largest refinery in the world after the expansion.

With bauxite mineral reserves adding up to 600 million ton, because of the Alumina Rondon project the position of Votorantim Metais as one of the largest Brazilian mining companies is firmly consolidated. Votorantim Metais is part of the Votorantim Group, the Brazilian holding present in more than 20 countries.

### Votorantim Metais

- Total headcount of **10 thousand** employees in 17 industrial units: Brazil, USA, China and Peru
- Net revenue **R\$ 9,2 billion** in 2012
- Brazilian aluminum market leader
- Largest electrolytic nickel producer in Latin America
- Ranking among the five largest zinc producers in the world

### Alumina Rondon

- Mineral Potential Resources **1,6 billion** tons
- Initial production of bauxite **7,7 million** tons/year
- Initial production of alumina **3 million** tons/year

Votorantim Metais opening new frontiers



# Dear readers,

.....

Brazil will be a name that we will be hearing a lot more often over the next three years, with both the 2014 FIFA World Cup and the 2016 Olympic Games taking place in the beautiful South-American country. Beyond the billions of sports fans that they will attract in front of televisions worldwide, these mega-events are also key to understanding the current social and economic climate of Brazil.

Brazil was one of the world's best performing countries three years ago, coming out of the recession in 2010 with a strong GDP growth rate of 7.5%. This fact, coupled with the expectations for progress that the upcoming World Cup and Olympics will generate, puts Brazil on a highhorse of confidence for future development.

It is therefore no surprise that the 2.7% GDP growth rate of 2011 and the 0.9% of 2012 (the lowest of any of the BRICs during that year) came as big disappointments, creating a wave of discontent across Brazil. The people went out on the streets asking for strategic investments not only in \$400 million stadiums, but in infrastructure, health and education, the foundations of a healthy economy and of a strong country.

It is within this social and economic climate that Brazil's mining industry is trying to find the necessary traction to step up to its potential. With 9,000 mining companies generating a mineral production of \$51 billion in 2012, Brazil's mining sector remains dominated by iron ore. The avalanche of richness available has yet to be unleashed, with only 35% of the country being mapped so far.

Perhaps there is no other factor that has hampered the development the industry more over the past five years than the long awaited implementation of a new Mining Code to replace the current version that dates back to 1967. Although the momentous event of passing the Code to Congress happened on June 18th 2013, the discussions will most probably occur at a far slower pace than the industry desires. This will only further prolong the reluctance of investors to pump serious money into the mining sector, which has already been impacted by the drop of commodities prices worldwide and a weaker global economy.

Still, drawing the line, Brazil is home turf to companies such as Vale and Votorantim and with other giants such as Anglo American firmly committed to the country there is no backing down from further developing the sector.

Moreover, there are several core elements inherent to Brazil, as a country, as a nation, that make its future perspectives look nothing but tremendous. Firstly, the amplitude of the 2013 protests themselves, the conviction and the determination of the people on the streets prove that Brazil is a functioning democracy. Civil society is aware of both its power and role and can hold its governing forces accountable; this fact in itself is a sign of a mature nation. Secondly, Brazil's openness and its European heritage have created a society culturally in line with that of the Western World, a factor which only amplifies the attractiveness for investments.

Thirdly, there is no lack of ambition for Brazilians and the standards they are upholding for the development of their country are world-class. Granted, there will always be room for infrastructure improvement in a country half the size of South-America but with multi-lane highways crossing the country and five active airports in the top two of its major cities, we cannot talk about underdevelopment. Finally, by force of its size and mineral richness, Brazil is too big of a target to be ignored.

This book is a microcosm of the diversity of players active in Brazil's mining industry, ranging from association leaders, to major producers, and to service and consulting companies. We would like to extend our sincere gratitude to all those who shared their insights and expertise with us.

With Fond Regards,

**Razvan Isac, Ana-Maria Miclea,  
Clotilde Bonetto Gandolfi and  
Nathan Allen,  
Global Business Reports**



# International Producers

Exclusive interviews with major producers such as Anglo American, Votorantim Metals, Horizonte Minerals and Norsk Hydro reveal the true opportunities and challenges of Brazil.



25, 32, 33, 34, 39, 51

## Case Study

A detailed exploration of Brazil's national mining giant Vale, including an exclusive interview discussing the details and S11D, the largest project in the history of the company.



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## Minas Gerais

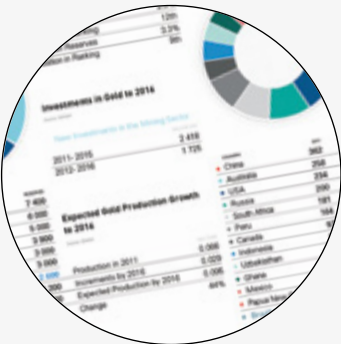
The hub of Brazil's mining industry, interviews and editorials explain the continued success of Minas Gerais and why it serves as a focal point services, training and innovation.



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## Quantitative Data

The most relevant quantitative data presented in the most easily accessible format, allowing you to view economic and market statistics, identify trends and visualize infrastructure.



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All interviews were conducted between February and August 2013. Interviews may therefore not reflect the most recent developments of the companies featured.

This research has been conducted by Clotilde Bonetto Gandolfi, Razvan Isac, Ana-Maria Miclea and Nathan Allen Edited by Barnaby Fletcher I Designed by Gonazalo Da Cunha A Global Business Reports Publication For more information, contact info@gbreports.com follow us on Twitter @GBReports or check out our blog at ggroundup.com



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# The Sleeping Giant:

## An Introduction to Brazil and its Mining Industry

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“Brazil is a challenging country to work in, but China poses even more challenges, and out of all of the BRICS, Brazil is the friendliest and most open culturally. As there is much bureaucracy like in other large countries, one has to develop the domestic industry first and this, in turn, created barriers to entry. The reality is that it simply becomes a case of learning the rules.”

- Diógenes Paoli Neto,  
Managing Director, AGGREKO BRAZIL



Source: Shutterstock



# An Introduction to Brazil

A brief overview of the country and economy

In 2001 the BRIC acronym was coined by Jim O'Neill of Goldman Sachs. Over the next eight years Brazil seemed to grow into its role as the first letter of the world's most important global economies. Its middle class boomed, pulling in foreign investment, and its economy surged. Not only was it the largest country in South America in terms of populations and geographical size, it was also at the forefront of the region's economic resurgence. By the mid 2000s, the world was talking about two growth areas; South-east Asia and Latin America; and Brazil was the prize: less insular than China, more raw potential than almost anywhere else in the world, and a fun destination for a business trip.

Yet no matter how hackneyed the sentiment has become, the old cliché of Brazil being the country of the future remains frustratingly accurate today. After five years of annual GDP growth averaging just under 5% prior to the global financial crisis of 2009 and a dramatic recovery after recession in 2009, economic growth in the past two and a half years has been turgid: 2.7% in 2011, 0.9% in 2012 and a forecast 2.2% growth in 2013. Latin America as a whole is no longer the competitor to Southeast Asia: as economies on the other side of the world continue to surge forward and new players in Africa make their mark, the Latin economies seem to be puffing for breath after their brief sprint. There are some

notable exceptions: Brazil is not one of them. The recent unprecedented outburst of public demonstrations across the country is a clear barometer of the prevailing national sentiment. The population believes that Brazil can do better. They are right. Despite the gains made in the past decade, the country falls well short of its potential, hindered by a range of issues that, while substantial, are not insurmountable.

The acute shortage of skilled labor remains problematic and infrastructure coverage in many areas is sorely lacking, particularly in terms of public railroads and ports. The bewildering array of taxes levied on domestic manufacturers makes it difficult for the local industry to remain competitive, and the astonishingly slow speed with which approvals and permits are awarded, especially in the mining industry, is a major stumbling block to the development of new projects. Infrastructural underdevelopment, expensive raw materials, insufficient technological emphasis and a governmental tendency towards overprotection will continue to hinder Brazil's most promising sectors, such as the chemical industry.

Solutions exist for each of these issues and they are implemented. The pace is slow, but companies remain optimistic: such huge potential cannot go unfulfilled forever. "There is a lot of optimism in Brazil surrounding the forthcoming mega-events and the new

infrastructure that is accompanying these events presents direct opportunities for our company. However, beyond these direct consequences, we are confident that these events will help promote a more systemic change in consumer behavior. Brazil has always been a country that demonstrated huge potential and its significant internal demand will bring several new exciting opportunities for us," said Angelo Bianchini, regional president of Latin America for Dow Corning.

If the right political moves are made then there is little doubt that the situation will improve. Legislative measures such as the New Ports Law, which will open up the country's ports to private investment, are a sure step in the right direction, and whilst the release of the long-awaited New Mining Framework is far from a panacea, it is at least a definitive action that should serve to attract investment to the mining industry.

In the meantime, the country is not without its success stories. Though the overall picture may not be the high growth and excitement that the past decade promised, some companies have still managed to tap into Brazil's potential despite the issues. Increasingly, local companies are not just competing on the international stage, but taking a leading role in innovation and quality. If they can achieve success despite the current issues, they will be extremely well placed to thrive once firmer foundations are set. •

# 0.9%

**GDP GROWTH RATE**  
2012

Source: World Bank, CIA World Factbook

# \$2,252

TRILLION

**GDP**  
(current US dollars) 2011

Source: World Bank, CIA World Factbook

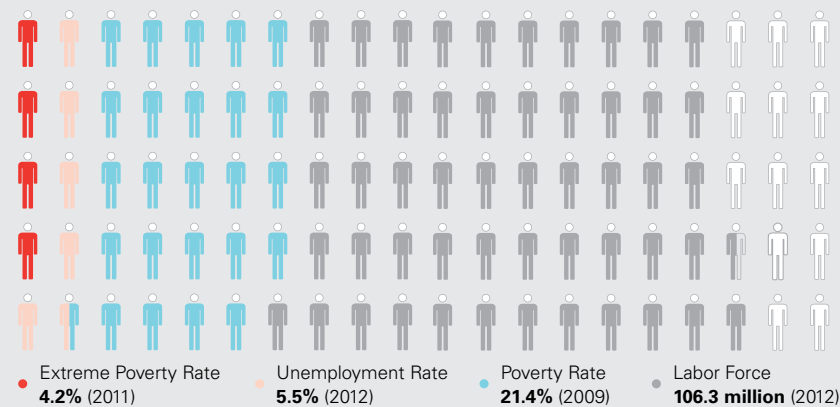
# 5.4%

**INFLATION RATE**  
Average Consumer Prices 2012

Source: CIA World Factbook

## Population and Workforce information

Source: CIA World Factbook



## Brazil at a Glance

Source: CIA World Factbook

**Population:** 201,009,622 (July 2013 estimate)  
**Capital:** Brasilia  
**Head of Government:** President Dilma Rousseff  
**Currency:** Real (BRL)  
**GDP:** \$2.396 trillion (2012 estimate)  
**Growth Rate:** 0.9% (2012 estimate)  
**GDP per Capita:** \$12,100 (2012 estimate)  
 Economic sector breakdown: agriculture: 5.2%, industry: 21.5%, services: 68.5% (2012 estimate)  
**Exports:** \$242.6 billion (2012): transport equipment, iron ore, soybeans, footwear, coffee, autos  
**Imports:** \$223.2 billion (2012): machinery, electrical and transport equipment, chemical products, oil, automotive parts, electronics  
**Major Trade Partners:** China, US, Argentina, Germany







INTERVIEW WITH

# Dr. Fernando Pimentel

MINISTER OF DEVELOPMENT  
INDUSTRY AND FOREIGN TRADE

Ten years ago, the main trading partners for Brazil were the USA and Europe. Since then, Brazil has seen a diversification of its export reach, which has increased by 450%. Could you provide us with an overview of these developments?

Between 2003 and 2012, Brazil's trade flow grew from \$122 billion to \$466 billion, and over the same time period exports grew from \$73 billion to \$243 billion. Our increased presence in global trade confirms the effect of a series of measures adopted by the federal government in recent years in order to augment the level of national exports. The governmental policy for foreign trade was conceived in order to protect traditional industry sectors, much like in the USA and in the EU, while also looking out for new trade partners and opportunities, particularly in Africa and Asia. In order to feed this industrial growth, imports were also augmented to supply the raw materials still not produced in Brazil. In 2003, imports were worth \$48 billion and last year they reached the amount of \$223 billion. This demonstrates the degree to which the country is open to commercial trade with other nations. In 2012, import-export activity was done with over 120 countries among which the main trade partners were China, the US, Argentina, Germany, and the Netherlands.

At the start of the international economic crisis in 2009, Brazilian exports fell by 22%. We managed to make up for this loss in the following years, with exports reaching \$243 billion in 2012, the second highest value in recorded history and with an end of the year surplus of \$19.4 billion. We expect a positive trade balance in 2013 as well, despite the challenges we have ahead; these include an expected growth in competition on the international market and the fall in consumption in many countries as a result of the international financial crisis. Nonetheless, we are optimistic

because Brazil's economic performance is peaking at the moment, helped by the political and economic stability that is encouraging private investment in the country.

Plano Brasil Maior underlines the Federal Government's industrial policy for the upcoming years. Could you provide us with an overview of its most important components with regard to the country's mining industry?

Plano Brasil Maior is the industrial and technological policy for services of foreign trade and this initiative brings together a series of actions and measures that have the aim of strengthening the national industry in the face of international competition. With this in mind, 19 priority sectors were chosen due to their economic importance and the competitive challenges they face due to excessive imports or a lack of innovation.

With regards to the mining sector, three main goals were set as targets for 2017, the current deadline of the Plano Brasil Maior. They are to strengthen the mining activity in the country, to promote national technological innovation and research, and to increase the value-added of the mining industry. These goals will encourage the discovery of new mineral deposits, the increase of finance opportunities levels for mining projects, and the augmentation of private and public spending in research, development, and innovation. They also aim to attract foreign technology companies and offer modernisation programmes for mining equipment and machinery.

What will be the main industrial sectors that will drive investments in Brazil over the next three years and what is Brazil's economic outlook for the future?

In the last few years, Brazil has seen around 40 million consumers cross the poverty line to enter what we call the new middle class

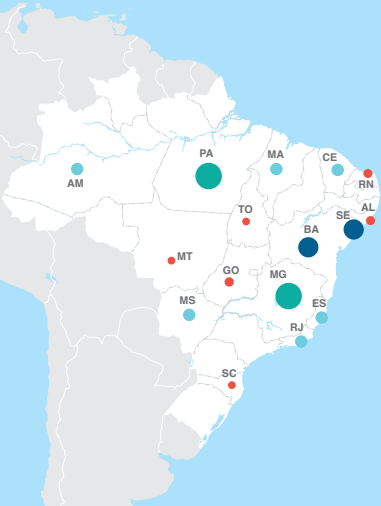
and this movement within the Brazilian social pyramid clearly owes a lot to the social programmes adopted by President Lula's government. The end result of this social transformation is that Brazil now has the fifth largest consumer market in the world, for every type of product, ranging from hairpins to automobiles and aeroplanes.

This new reality has made Brazil even more attractive to global investors and recently, the federal government launched the Book of Investment Opportunities in Brazil (Catalogo de Oportunidades de Investimento no Brasil), which is a document that enlists 140 national projects that have a total estimated value of over \$200 billion. These landmark projects were selected in conjunction with state authorities and they represent future large investments in infrastructure, logistics, oil and gas, and naval and automotive equipment.

In order to make Brazil more attractive, the federal government has been implementing new regulatory measures that have reduced taxes, increased access to credit and modernized labour regulations. To that end, labour costs have already diminished in 40 industrial sectors and we are also seeing a drop in the prices of electrical energy. Brazil's current path is one of transition towards a country that produces more cheaply, with lower costs, a country that has a good grasp on its inflation levels, a strong legal system and a democratic climate. We have a lot of work ahead of us, yet we have a clear direction, as demonstrated by the levels of direct foreign investment, which reached \$65 billion in 2012, the fourth highest in the world. •

## Major Regions with Mineral Deposits

Source: IBRAM



AM - USD 2,666,401.65 - 3.56% - Potassium  
TO - USD 96,960.06 (0.13%) - Phosphate and Gold  
MT - USD 621,513.99 (0.83%) - Limestone, Zinc and Gold  
MS - 1,939,201.20 (2.59%) - Iron and Logistics  
GO - USD 242,400.15 (0.32%) - Copper and Nickel  
SC - USD 145,440.09 (0.19%) - Coal  
RJ - USD 1,939,201.20 (2.59%) - Logistics  
ES - USD 2,776,936.12 (3.70%) - Iron and Logistics  
G - USD 26,160,139.73 (34.88%) - Bauxite, Alumina, Iron, Phosphate, Gold, Logistics  
BA - USD 6,535,216.11 (8.71%) - Iron, Gold, Vanadium, Nickel, Chromium  
SE - 5,763,736.91 (7.68%) - Potassium  
AL - USD 121,200.08 (0.16%) - Copper  
RN - USD 387,840.24 (0.52%) - Iron  
CE - USD 2,464,294.12 (3.29%) - Phosphate and Uranium  
MA - USD 1,713,284.26 (2.28%) - Logistics and Gold  
PA - USD 18,129,592.04 (24.17%) - Aluminum, Bauxite, Manganese, Copper, Iron, Nickel and Gold

## Major Regions with Mineral Deposits

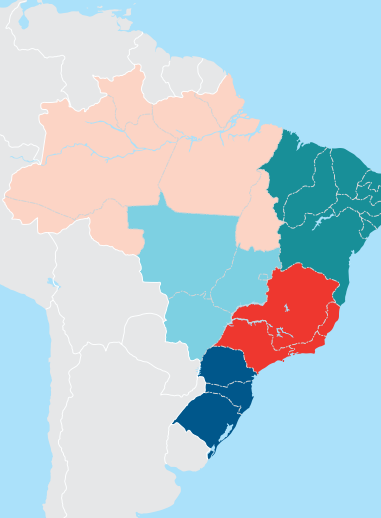
Source: IBRAM



● Copper  
● Gold  
● Aluminium  
● Tin  
● Iron - Manganese  
● Graphite  
● Kaolin  
● Nickel  
● Coal  
● Aggregates

## Mining Companies by Region (2012)

Source: DNPM



● Mid-West: 1,075 companies  
● Northeast: 1,606 companies  
● North: 515 companies  
● Southeast: 3,609 companies  
● South: 2,065 companies

# Mining in Brazil

Exploiting unexploited potential

Brazil's 8,514,877 square km makes it the fifth largest country in the world. Perhaps more relevantly, it makes it the largest country in Latin America, arguably the most prospective mining region in the world. In 2012, Latin America attracted 25% of global non-ferrous exploration spending, more than any other region. In some respects, Brazil lives up to this geographical dominance and position. It is home to roughly 9,000 mining companies, produces around 80 mineral commodities, is a leading global producer of iron ore, niobium, bauxite and manganese, and is a significant global producer of gold, copper and tin. Its mineral production was valued at a substantial \$51 billion in 2012 (a slight decrease of 3% compared to 2011).



Yet when one thinks of the great mining jurisdictions around the world, Brazil does not spring to mind. Even constricted to Latin America, Chile, Mexico, and more recently Peru spring to mind before their larger regional peer. Brazil attracts a similar amount of exploration investment to Argentina, a country a third its size. It attracts less exploration investment than Mexico, Peru or Chile. This is undoubtedly not helped by the fact that only 35% of the country's geology has been properly mapped so far by the CPRM (the Federal Government's Geological Agency).

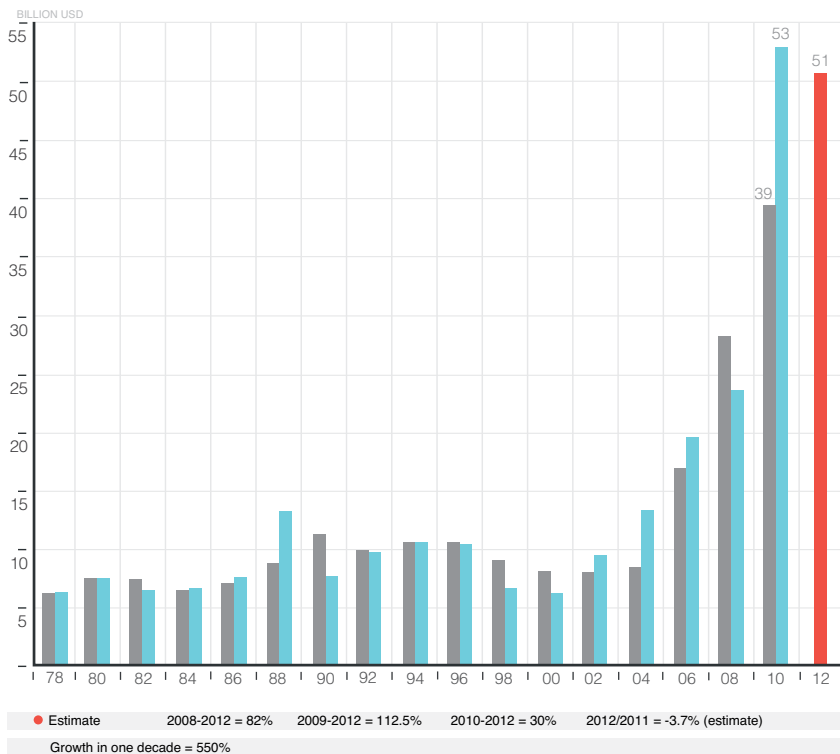
An indirect consequence of this fact has been the strong geographical concentration of mining activities in Brazil, where the states of Minas Gerais and Para account for a total of 82% of all mining revenues. The mining industry, responsible for 2.2 million direct jobs, attracts average yearly investments of \$ 15 billion, out of which 63% are absorbed by iron ore, which also accounts for 80% of the Brazil's mineral exports. However, with mineral prices falling in 2012, the South-American country saw its revenues shrink despite its record production during the year. Furthermore, in light of its natural resources, Brazil still inexplicably lacks self-sufficiency in its fertilizer minerals, importing \$ 3.5 billion worth of potassium chloride a year. Finally, the uncertainties created by Brazil's new mining code (which will replace its current one that dates back to 1967), along with the global economic crisis, have created a climate of investment reluctance and skepticism in Brazil over the course of the last 18 months.

Nonetheless, the country's mining industry has had an impressive run in recent years, more than doubling its output since 2009 and recording a positive trade balance of \$29.5 billion last year. If anything, Brazil's failure to properly exploit its potential mineral wealth up until this point has made it a more attractive prospect now: the possibility of massive undiscovered deposits is arguably greater under Brazil's vast stretches of plains and plateaus than under the picked over and scoured deserts of Chile or mountains of Peru and Mexico.

As with other economic sectors in Brazil, lack of infrastructure and cumbersome bureaucracy has hindered development up until now. This is changing: slowly and in faltering steps. Yet the implementation of a new mining code, and the proven success of the companies already operating in the market, should encourage investors to refocus their attention to the country that occupies 47% of all South America. •

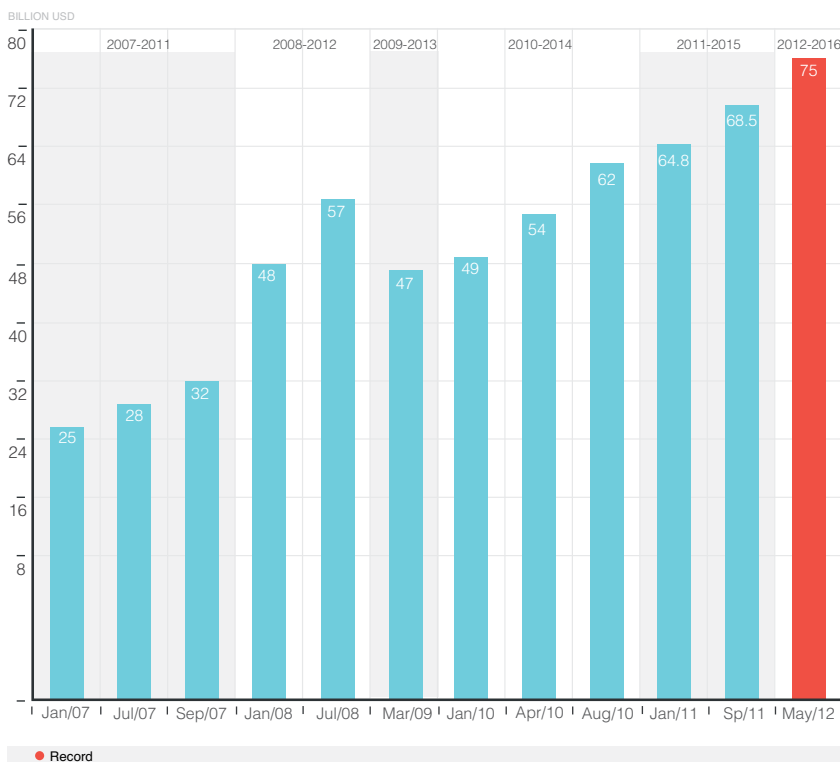
### Brazil's Mining Production

Source: DNP, IBRAM



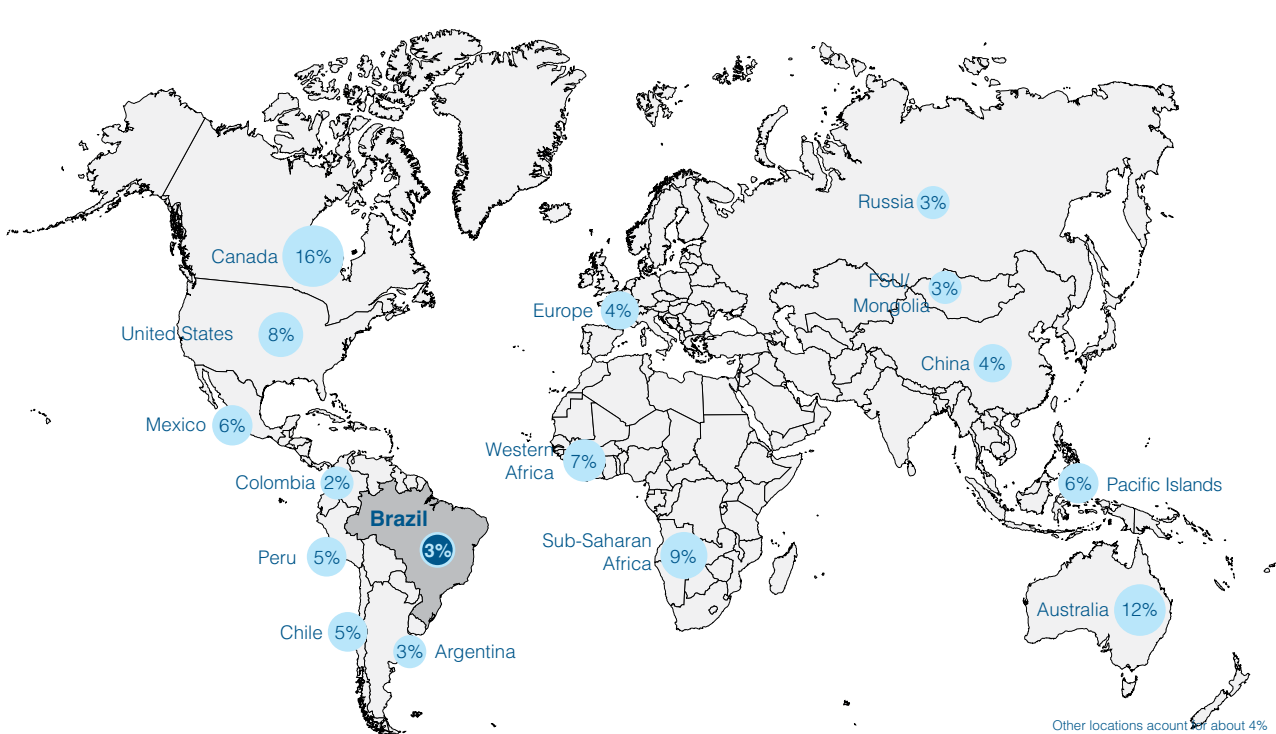
### Investments in the Mining Sector

Source: IBRAM



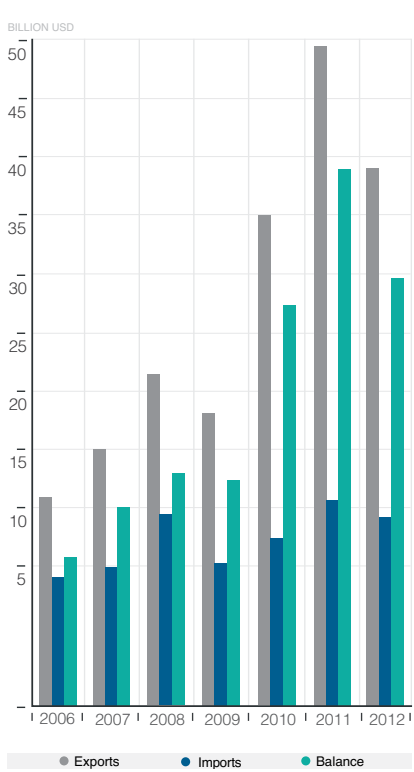
### Global Non-Ferrous Exploration Expenditure (2012)

Source: Metals Economics Group



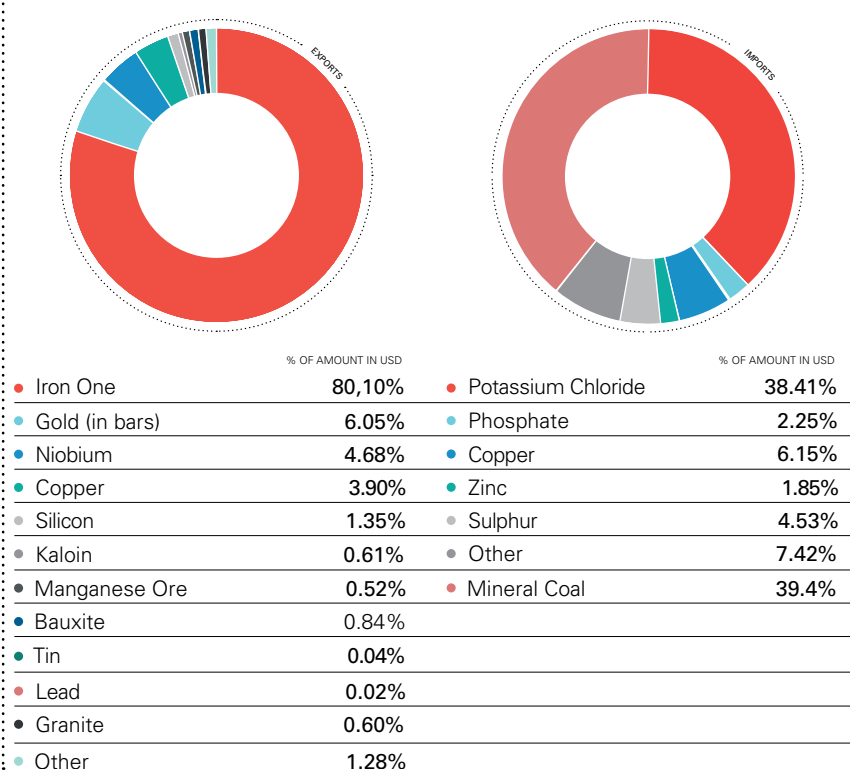
### Mining Industry Trade Balance (2012)

Source: MDIC / Aliceweb



### Mineral Imports and Exports

Source: MDIC / Aliceweb







INTERVIEW WITH

# José Fernando Coura

CHIEF EXECUTIVE OFFICER  
INSTITUTO BRASILEIRO DE MINERAÇÃO (IBRAM)

What concrete policy measures would you like to see taken to make Brazil's mining sector more competitive?

The core issue that is strongly reducing the competitiveness of the mining sector in Brazil today is related to the delays in obtaining environmental licence from the authorities. We have developed strong internal capability to handle with environment issues, to prepare good EIA studies and to think about the measures for impact's mitigation, but the big problem is the lack of capability in many state environmental agencies. As a result, the environmental license process in Brazil is unpredictable in terms of timing. This costs a lot of money for a mining company and exposes it to unnecessary risk. We have also to remember that mining is a global business, totally connected to the international commodities market and, sometimes, those delays could result in failure in the company's strategies. In this sense, a concrete measure which will bring a tremendous increase in terms of the competitiveness for the mining sector in Brazil would be the adoption of a more rational environmental license process, specifically developed for the mining activity, considering its constraints and its inherent characteristics.

Another challenge is the availability of good geological information. Unfortunately, we still have in Brazil a lack of good geological information, considering that less than 30% of the Brazilian territory is duly mapped in adequate scale, which is in the minimum of 1:100.000. In this sense, a good measure would be the Government considering investments in geological studies as a core priority in terms of public policy, allocating sufficient resources for this and defining a timeline on this.

What is IBRAM's position on the New Mining Code and what kind of amendments should be made to the current draft?

We are just in the beginning of a length discussion process which started last June, when the President sent to the Parliament a bill of law. We have a convergent position with some aspects, specially the notion of legal security that the New Mining Code is assuring. All the previous mineral rights are totally secured, which is very welcome. We also appreciated the way that the President used to send the law proposal, through the Parliament, because we were aware the other ways she could use, by a Provisional Law, which is a tool with reduced possibility of stakeholders' participation in the process of formulation and with immediate effects. So, the Parliament is the right address to support this strategic discussion to the Brazilian society and we are confident about the possibility of having a truly participatory process aiming to strength the proposal. We also are convergent with the proposal of creating the National Mining Counsel, linked to the President and the National Mining Agency, replacing the actual DNPM. We believe both measures will reinforce the political status of the mining sector in Brazil.

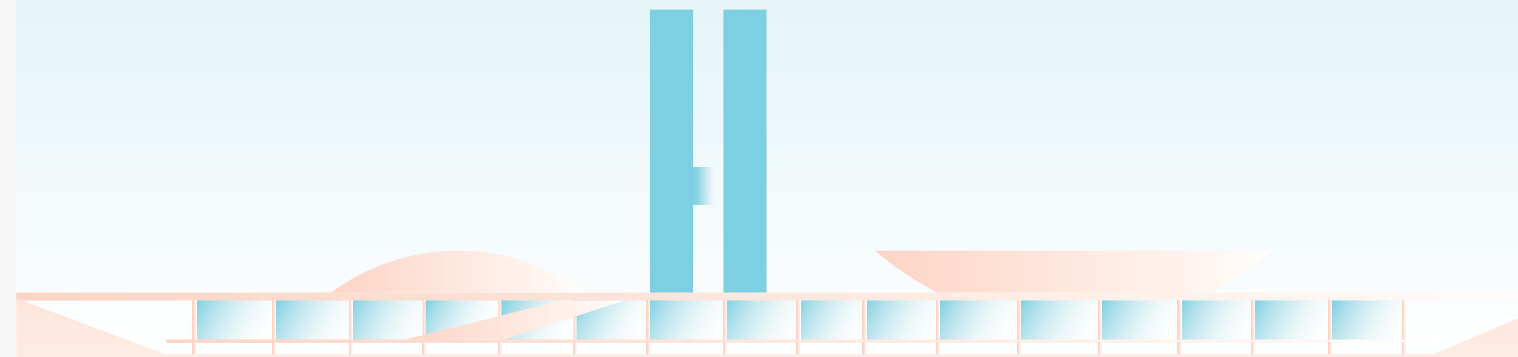
How is IBRAM advocating towards a more sustainable mining sector in Brazil?

Diverse studies and well-known sustainability publications are ranking mining sector in Brazil among those with better performance. As an example, the magazine *Análise Gestão Ambiental* [Environmental Management Analysis] produced a special report to Rio+20 Conference, analysing the performance of 28 sectors in the Brazilian economy, considering 1,200 indicators and interviewing 840 companies. As a result, the mining sector was ranked in first in terms of sustainability performance. But, of course, we have problems, especially in the sector of small mining companies, for those investments in sustainability are still considered as costs and not in-

vestments. We also must improve the general performance of the sector in terms of health and safety indicators. As I mentioned before, IBRAM is implementing diverse technical programs that are aiming to increase the general performance of mining here. They are complementary strategies for the mining companies, especially those related to cutting-edge issues, as climate changes and water management, which due its innovation, will demand long term process of individually absorption, being that IBRAM works as facilitator in this way. At the same time, we are operating a traditional Health and Safety Program, focused in risks management approaches, which is always bringing new ideas and pointing to new ways to the mining companies here in Brazil. •

# Brazil's Regulatory Framework

The jury is still out



Ever since Brazil's 17th Century gold rush, when tax disputes were a frequent occurrence between Portuguese pioneers and representatives of the Crown, the country's legal system has maintained a complicated relationship with mining. Up until recently, the antiquated mining code (not updated since 1967) was one of the main factors deterring investment in the sector. In 2008 the possibility of a new mining code has been discussed, yet despite abundant rumours and a number of false starts nothing ever materialized.

At the beginning of this year, the anticipation increased. Experts began speculating on what a new mining code would contain. "It will be based upon two main pillars: an increase in government participation, by means of taxes and royalties, and an effort to incentivize the industry towards more development," claims Pedro Henrique Jardim of lawyers Machado Meyer Sendacz Opice.

On the 16th of May MP 595, more commonly known as the new Port Law, was passed by the Brazilian Congress, leading many to hope that, with this out of the way, the door was now open for discussion of new mining regulation. "There is a 95% chance that the federal government will submit a bill to Congress this year," asserts Bruno Werneck, partner at São Paulo-based law firm Mattos Filho Veiga Filho, Marrey Jr e Quiroga Advogados. Werneck was proved correct. On June 18th 2013 the long-awaited New Mining Code was released to Congress. The importance of this cannot be overstated: without being able to offer clear rules of play, the South American giant fell behind its smaller neighbours in attracting mining and exploration investment.

Now that the legislation has passed into the public domain, the response from the industry has been, perhaps unsurprisingly, rather lukewarm. As expected, the code addresses

three main issues: royalties, the concessions system, and the establishment of a new independent mining agency, the ANM, but it does not offer an instant solution to all the industry's woes. On the contrary, as is often the case in Brazil, the pace of progress is expected to be painfully slow. Now that the bill has lost the constitutional urgency proviso with which it was originally released, the forecasted timeline to pass through the political system is anywhere between one and two years.

Although opinions differ wildly, the majority of parties involved in the sector actually welcome this development, viewing it as an opportunity for the private sector to have its voice heard and exert a positive influence on those aspects of the code that are unclear or are seen to be potentially damaging to the industry.

Under the current system, royalties' payments, officially known as the Financial



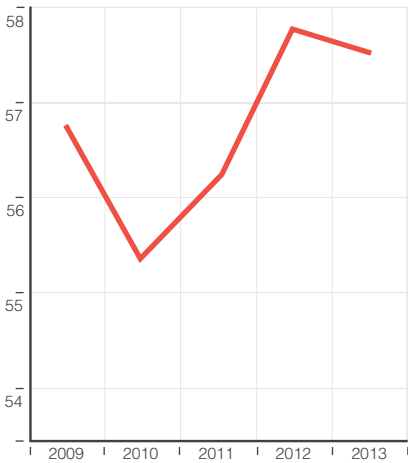
Doing Business

Source: World Bank

COUNTRY	EASE OF DOING BUSINESS RANK	STARTING A BUSINESS	DEALING WITH CONSTRUCTION PERMITS	GETTING ELECTRICITY	REGISTERING PROPERTY	GETTING CREDIT	PROTECTING INVESTORS	PAYING TAXES	TRADING ACROSS BORDERS	ENFORCING CONTRACTS	RESOLVING INSOLVENCY
Chile	37	4	17	12	5	7	5	1	5	3	15
Puerto Rico (U.S)	41	1	31	10	20	1	3	14	19	14	2
Peru	43	9	18	21	1	4	2	9	8	18	17
Colombia	45	10	8	30	4	10	1	13	17	26	1
Mexico	48	5	10	28	25	6	12	15	9	7	3
St. Lucia	53	8	3	2	16	20	5	2	24	28	9
Panama	61	3	16	3	12	7	14	31	1	22	19
Antigua and Barbuda	63	17	7	5	19	20	5	25	25	5	12
Dominica	68	7	6	17	17	13	5	7	18	30	16
Trinidad and Tobago	69	15	21	1	32	4	4	11	12	30	22
St.Vincent and the Grenadines	75	11	1	7	26	26	5	6	3	12	31
The Bahamas	77	16	14	13	33	13	21	5	7	21	7
Barbados	88	14	12	22	28	13	27	17	2	16	4
Uruguay	89	6	32	6	29	10	18	23	22	15	8
Jamaica	90	2	11	25	11	20	14	30	23	24	6
Guatemala	93	30	20	9	2	1	26	19	26	10	18
St.Kitts and Nevis	96	13	4	4	30	26	5	21	10	20	31
Grenada	100	12	2	18	27	20	5	9	11	27	31
Paraguay	103	19	15	8	7	13	13	24	32	17	26
Belize	105	28	5	15	23	26	23	3	21	29	5
Costa Rica	110	21	26	14	3	13	27	20	6	23	20
El Salvador	113	24	29	29	6	7	27	27	13	4	13
Guyana	114	18	9	32	15	33	14	16	15	6	24
Dominican Republic	116	23	23	24	14	13	18	12	4	9	27
Nicaragua	119	22	30	27	18	20	18	29	14	2	11
Argentina	124	26	33	20	22	10	21	26	30	1	14
Honduras	125	27	13	23	9	1	27	22	16	32	21
<b>Brazil</b>	<b>130</b>	<b>20</b>	<b>27</b>	<b>16</b>	<b>13</b>	<b>20</b>	<b>14</b>	<b>28</b>	<b>27</b>	<b>19</b>	<b>25</b>

Economic Freedom

Source: Heritage Institute 2012, Institute of Economic Freedom



Contribution for Mineral Collection (CFEM), are calculated based on a company’s net revenue, but this is set to change to a baseline of gross mineral sales, which would equate to an overall increase. Furthermore, the rates themselves will increase across all minerals. Whilst this is understandably an unpopular measure amongst miners, it is far from unexpected and will bring the financial contribution made by miners to local communities closer in line with the world average. Perhaps the most controversial element of the new code is to be found in the proposed overhaul of the concession system. Today, Brazil’s operates a priority system, with the first claimants to produce a plan to develop a piece of land receiving the exploration rights. The new proposal is to introduce an auction system akin to that adopted by the oil and gas sector. However, this is potentially a very risky move; by forcing interested parties to

bid on land which, before any exploration work has taken place, is basically worthless, the authorities may actually deter investors. The third principal element of the new code will be to substitute the existing government organ responsible for mining, the National Department of Mineral Production (DNPM) for a new National Mining Agency (ANM). This has provoked a wide range of reactions amongst experts: whilst many are skeptical of the level of independence and autonomy that such an entity would possess some commentators point to the success of the National Petroleum Agency, set up in 1997 to regulate Brazil’s burgeoning oil and gas industry, as a positive sign. One element that is conspicuous by its absence in the new code is any modification of existing environmental laws. Today in Brazil there is a certain degree of tension between miners and environmental authorities, and

Royalties by Country (2012)

Source: PwC

COUNTRY	COPPER	GOLD	IRON ORE	COAL	%
Argentina	3	3	3	3	
Australia	1: 2.7-3.5, 2: N/A	1:0-2.5, 2: N/A	1: 6.5-7.5, 2: 22.5	1: 7-10, 2: 22.5	
<b>Brazil</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	
Canada	3: 16, 4: 2-13, 5: 5-10	3: 16, 4: 2-13, 5: 5-10	3: 16, 4: 2-13, 5: 5-10	3: 16, 4: 2-13, 5: 5-10	
Chile	0 -14	0 -14	0 -14	0 -14	
China	1: RMB5-7/ t, 2 :0.5-4	1:RMB1.5 -7/ t, 2: 0.5-4	1:RMB 10-25/t, 2: 0.5-4	1:RMB 2-8/ t, 2: 0.5-4	
Congo, D.Republic of	2	2.5	0.5	1	
Congo, Republic of	3	5	3	3	
Germany	N/A	N/A	N/A	N/A	
Ghana	5	5	5	5	
India	1: 4.2, 2: IHR 3000/Ha	1:2, 2:1 NR 4000/Ha	1: 10, 2:INR 1000/Ha	1:INR55 +5(P) -INR 130 +5.(P), 2:INR 1000/Ha	
Indonesia	4	3.75	3	3-7	
Kazakhstan	5.7	5	2.8	0	
Mexico	N/A	N/A	N/A	N/A	
Peru	1: 1-12, 2: 2-8.4, 3: 4-13.12	1: 1-12, 2: 2-8.4, 3: 4-13.12	1: 1-12, 2: 2-8.4, 3: 4-13.12	1: 1-12, 2:N/A, 3:N/A	
Philippines	3 :2, 4: min.5, 5: as agreed	3: 2, 4: min.5, 5: as agreed	3: 2, 4: min.5, 5: as agreed	PhP 10.00/ mt, 4: min. 5, 5:as agreed	
Russian Federation	8	6	4.8	varies	
South Africa	0.5 -7	0.5 -5	0.5 -7	0.5 -7	
Tanzania	4	4	3	3	
Ukraine	according to rate of main material	UAH 15.98/ t extracted	UAH 0.89-11.45/ t ●	UAH 0.57 -5.33/ t ●	
United Kingdom	N/A	N/A	N/A	N/A	
United States	3: 0, 4: 2-5, 5: 2-5	3:0, 4: 2-5, 5: 2-5	3:0, 4: 2-5, 5: 2-5	3: 8-12.5, 4: 2-5, 5: 2-5	

attaining an environmental license is widely acknowledged to be one of the most difficult and time-consuming stages of developing a project. Barton Stone, director of consultants Runge Pincock Minarco believes this is because the modern mining industry is a fairly recent arrival to Brazil, having only become established in the 1980s. “By this time other mining jurisdictions around the world had already worked out most of the environmental regulations they needed to impose on the industry. Without this head-start ... there is a definite lack of understanding toward the importance of the environment in small companies operating in Brazil.” said Stone. Essentially, the release of the new code to Congress has prompted as many questions as it has answered. Whilst it is certainly a positive step towards establishing a more stable mining jurisdiction and attracting more investment, many of the measures are unpopular in their current form and a lot of work remains to be done before any of the proposals become law. •



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INTERVIEW WITH

# Gary Poole & Barton Stone

PRESIDENT LATIN AMERICA &  
DIRECTOR  
RUNGEPINCOCKMINARCO

How did RungePincockMinarco perform in Brazil last year, and what are your expectations for this year?

**GP:** Brazil is the biggest market in Latin America, and it is growing at an incredible pace, which explains why RungePincock-Minarco has an office in Belo Horizonte. We have been very successful in Brazil recently, serving a large number of big projects for clients like Vale, MMX and Anglo American. Demand has been so high across a spread of commodities that we have had to bring in experts from other offices. We have worked in all our main areas, including reserve declaration, mining processes and mine design; in the last five months or so we have also seen rising interest in our technology products. RungePincockMinarco has been working hard to integrate all these products with each other and larger ERPs, like SAP. For big users of Caterpillar equipment like Vale, it will be highly beneficial to link our systems with theirs.

**BS:** Brazil is an excellent market for us; we have roughly doubled our staff in the 18 months I have been here. In the next year we are hoping for this office to grow between 20% and 25%; we went through a low point last August when iron dropped below \$100, but it is now back up above \$150. The world's largest concentration of iron falls within 100Km of this city, so it dominates everything we do. Recently we had eight or 10 iron projects on the go simultaneously, working across a broad range of disciplines. We often leverage the expertise that RungePincock-Minarco has globally by pulling in experts from our other offices to work on projects in Brazil for example, full-fledged metallurgists to work on these iron projects.

Brazil's mining industry is undergoing a number of changes and in this context, what

are the specific needs of your clients in the country today?

**BS:** Brazil's huge agricultural market has a big shortage of fertilizers. Most are imported today, but people are correctly arguing that the country can develop its own production. Iron dominates the mining industry, followed by copper and then gold, but we have seen a rise in the number of projects looking at potash and phosphate. The need is particularly great because in subtropical terrain the leaching of nutrients happens much faster than in temperate climates. Brazil's fertilizer deposits are also connected with intrusive rocks enriched in rare earth oxides, which can be valuable by-products. Investment in these projects is coming particularly out of Canada; Potash Corporation of Saskatchewan, the world's largest miner of potash, is interested in projects all around the world, as it realizes there are limitations on shipping the product out of central Canada.

Brazil is implementing a new body of mining regulations. What impact do you expect them to have on the sector?

**BS:** Brazil is a huge, remote country, and it has environmental issues. No one wants to see the mass of green trees cut down, but the country is maintaining a good balance. It is pro-mining – and its laws prevent greedy people tying up the land, in recognition that the country's resources belong to its people. The effect of Brazil's new body of regulations will be to lessen the frontier nature of the country. I have worked in similar Wild West environments in Australia and Africa, and seen how, while there needs to be the promise of rewards for initial developments, governments are eventually required to bring in regulation to stop them happening without consideration for people and the environment. Brazil makes some interesting political concessions

to small-scale miners, allowing them special permits. However, in my opinion, the single biggest issue facing mining around the world is water purity; there is universal concern about the industry taking water away from agriculture and communities. Brazil has more water than most parts of the world, but there is still a limit. It is gratifying to see mining companies here following the environmental suggestions we make.

Considering all the challenges of operating here, how hard has it been for local companies to compile JORC and 43 101-compliant reports?

**BS:** Currently about 90% of our clients are Brazilian-based, although sometimes we later discover they may be wholly-owned by foreign groups. The fertilizer industry, for example, is all Brazilian but with the money sourced from Toronto. RPM in Brazil has worked for 15 of the top 25 mining companies in the country, and has a client base of 54 different mining companies. Canadian NI-43-101 and Australian JORC compliant reports require the sign-off of the Qualified Person (QP) for Canadian jurisdictions and a Competent Person (CP) for Australian jurisdictions (same qualifications for standing but different terms are used). Our Brazilian office has QP and CP status for engineers and geologists for both foreign requirements. RPM's experienced staff can ensure that Brazilian projects meet Australian JORC and Canadian NI 43-101 compliance standards. •



"One aspect of the new code that does seem worrying is the supposed decision to move towards an auction system for mining concessions similar to the system they currently use in oil and gas. The aim of this move is to prevent companies from acquiring large numbers of concessions and then leaving them undeveloped for many years. But, on the other hand, the geological survey companies will be hesitant to invest their money in new research, fearing that their findings could later be put up for auction. And Brazil, with its vast territory, needs a lot of geological research."

- Cesar Rolim, Senior partner,  
Dinex Engenharia

"As for the New Mining Code, everyone in the industry is breathing a huge sigh of relief, as it seems that finally some level of certainty has returned to the sector. We predict that many projects that have remained on hold for the past few months will come back into action, and we are poised to take advantage of this resurgence in investment. This said, the proposed increases in the royalty payments may have the negative effect of making some mines financially unviable, so to a certain extent we will have to wait and see how everything plays out in the end."

- Márcio Borges Castro Alves, Director general,  
MCA Engenharia

## The New Mining Code: an industry perspective

"We are somewhat concerned about the impact that the New Regulatory Framework will have on MBAC. Although the code has been released to Congress, it is still unclear what the effects will be on phosphates; the royalty rates are still not certain, and neither is the methodology for calculating the tax base. We hope that the final regulations will be well thought out and will complete their supposed goal of making the national mining sector more competitive. As it stands, we are subject to more taxation for selling our phosphates over the state line from Tocantins to Bahía, than a foreign company is for bringing fertilizer into the country from China or Egypt."

- Carlos Braga, Vice president technical services,  
MBAC

"Speaking frankly, we do not see the new code in a very positive light. Looking first at the changes to the royalty system, the proposed increases are supposed to bring the country into line with other jurisdictions such as Mexico and Australia where they have very high rates. However, this is misleading because here in Brazil companies must pay significantly higher rates for all other taxes so unless the government provides compensatory measures across other taxes then most mines will be affected negatively. The transition to an auction based concessions system has the potential to be very damaging for the country because it will deter junior companies from investing in Brazil, and without the juniors nobody is willing to take any risks and develop new projects. What the country really needs is more foreign investment, a greater level of openness and more discoveries being made, but the code seems set on achieving the opposite."

- Helio Diniz, Vice president Brazil operations,  
Forbes and Manhattan

"It is true that the new legislation has caused a degree of uncertainty in the industry but we believe that it may actually have a positive impact on DRA. The increases in royalties will affect margins and drive down profitability for many producers, and they will have to respond to this by cutting costs in other areas and becoming more efficient. DRA is well positioned to help them achieve this by helping clients optimize their existing operations and recover their margins. In this way, we see the new code not as a problem, but as a great opportunity."

- Paul Carlin, Director,  
DRA International Brazil

"Firstly, the provisions given for the transformation period are very good, and we are thankful for this because there was a fear in the industry that the new measures would be imposed with no time for adjustment. It is not yet clear what the eventual effects of the new code will be, and it could take up to two years for the laws to pass through Congress. We are concerned about the proposals for the new auction system to grant concessions as we believe it could deter investors away from the country. The royalties were always bound to increase, but the commonly heard assertion that royalties in Brazil are much lower than the world average is misleading because of the plethora of additional other taxes that miners have to pay here. There is now discussion in Congress of compensatory measures that would take the form of reductions of other taxes, which is positive, but there was no mention of this in the original draft. The creation of the ANM could be a very positive move for the country, as the DNPM already functions in a similar way to an agency and the formalization of this status will give them more resources to work with."

- Tito Martins, President,  
Votorantim Metals





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# Geological Diversity:

## A Mineral-by-Mineral Guide to Brazil

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"Now we are expecting \$75 billion of new investments, only inside the mining sector, for the next five years. It is clear the investors are still considering investing in Brazil in the long term. When we separate this amount by mineral, it is possible to see that \$46 billion [61%] is going to iron ore sector, followed by \$7.8 billion [10.4%] to potash, \$3.7 billion [5%] to rare earths, followed by other minerals. As Brazil is very competitive in iron ore it is natural that the majority of these investments would go to this mineral. However, diversification will be a necessary strategy to increase the competitiveness of the Brazilian mining sector when you consider the long-term view."

- José Fernando Coura,  
Chief Executive Officer, Instituto Brasileiro de Mineração (IBRAM)



Source: Shutterstock



# Iron Ore

## Brazil's heavyweight champion

Iron ore reigns supreme in Brazil. The country is the third largest producer of iron ore in the world after Australia and China, has the second largest iron ore reserves after Australia in terms of both crude ore and iron content, is the world's second largest exporter of iron ore and, when you take into account niobium, is the world's leading producer of steel feed-stocks.

In 2012, the country's iron ore production rose to an estimated 510 million mt, up 11% from 2011. However, with global iron ore prices hitting a low of \$99 in September 2012 the value of its exports decreased by 26%, to roughly \$30.99 billion.

Despite this, iron ore still contributes a massive 80% of all Brazilian mineral exports. A substantial share of that belongs to Vale, a company that still vastly dominates the market, mainly through its Carajás and Itabirito assets. Nonetheless, Brazil is seeing an increasing number of companies bringing in considerable new capacity on the market thus diversifying the industry's landscape.

Remaining in Vale's sphere of influence we find Samarco, a privately held company founded in 1977, owned in equal parts by Vale and BHP Billiton. One of the leading iron producers in Brazil, with an annual capacity of approximately 22 million mt, Samarco is the eighth largest exporter of the country. With mining operations in the historical heart of Minas Gerais, concentrators in Mariana and Ouro Preto (both in Minas Gerais), and three pellet plants in Ubu (Espírito Santo), Samarco exports its pellet production to 25 countries through its own port terminal in Ubu.

The most prolific non-Vale asset coming soon into play is the much-awaited Minas Rio project, Anglo American's 26.5 million mt/y integrated project. Minas Rio entails mining operations in Minas Gerais, a 525 km slurry pipeline, and a dedicated port terminal in

EBX's Acu Superport in Rio de Janeiro. The project, which saw its capital expenditure go up \$3 billion to a total of \$8.8 billion in late 2012, has certified reserves of 1.45 billion mt of iron ore and a FOOS (First Ore on Ship) date set for late 2014. With 13,000 people working on 120 fronts, Minas Rio is currently around 65% complete overall and will have an operating expenditure of \$30 per mt at the port. Initially, the production will involve 26.5 million mt/y of 68% pellet feed but future ramp-ups could see Minas Rio expand to capacities of 60 million mt/y or even 90 million mt/y.

"Minas-Rio is by far the most significant investment of Anglo American in Brazil and in the world and at a regional state level, Minas-Rio accounts for over 10% of all the investments that have been done in Minas Gerais over the past decade, a proof of our commitment to Brazil and to the project itself. Over the past two years, the project went through a restructuring phase caused mainly by three important issues that we had to overcome. The first main problem that we had to face was related to the heavy rains that we experienced during late 2011. The second issue was repre-

sented by the three legal injunctions that were placed on the project, injunctions that came as a result of mismatched timing between Anglo American, state authorities and the public ministry and it took us 10 months to overcome this issue alone. Another troublesome component, which was intertwined with the legal injunctions, was the permitting and licensing required; Minas-Rio had over 300 licenses to acquire and today, we are short on only around 10 of them. The final issue that we had to solve was land access: Minas-Rio crosses 32 municipalities and we have had to deal with over 1,400 land owners since starting the implementation of the project. Since issuing the new schedule however, we have restructured ourselves, we have become better equipped to solve these issues and so far we have been very much on track," said Paulo Castellari, CEO of Anglo American Iron Brazil. In late July, Anglo American CEO Mark Cutifani announced that the company was looking for a partner for Minas Rio but that the project was largely derisked already. Arguably, after many challenges and capital expenditure increases, this fully integrated project seems finally on track. —> 24

“If you look at the global trends right now, it is obvious that China will continue to dictate demand for iron ore through urbanization and steel consumption per capita. Right now, we see a lot of production for iron ore coming out and while demand has decreased, we are still looking at 2.5% to 3.5% CAGR for the next six years, which is still a good level. The challenge will be for this new capacity, that is often of lower grade material and more expensive to be produced to actually become viable and that is where Minas-Rio holds a very significant advantage due our low operating costs and the good quality of our ore.”

- Paulo Castellari-Porchia,  
CEO, Anglo American Iron Ore Brazil

## Iron Ore Prices

Source: The Steel Index



## Investments in Iron Ore to 2016

Source: IBRAM

BILLION USD

### New Investments in the Mining Sector

2011- 2015	44 969
2012- 2016	46 032

## Iron Ore Exports

Source: Aliceweb

MILLION USD

2010	28, 912
2011	41,817
2012	30,989

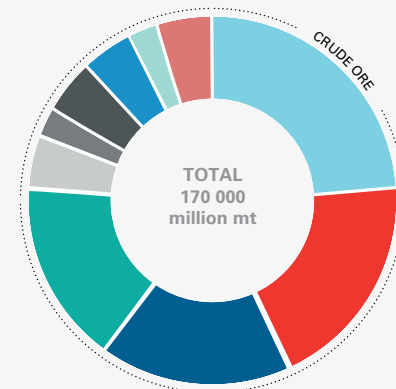
## Brazil's Iron Ore in a Global Context

Source: PNM, IBRAM

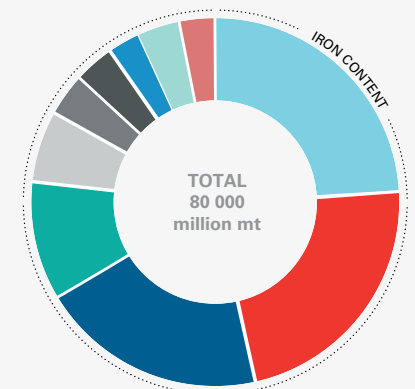
Global Production	17%
Position in Ranking	2nd
Brazilian Reserves	11%
Position in Ranking	5th

## Iron Ore Reserves by Country

Source: USGS

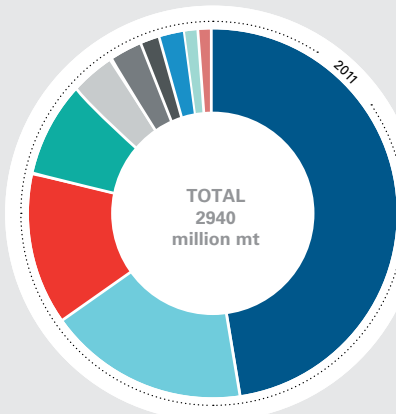


COUNTRY	CRUDE ORE	IRON CONTENT
Australia	35000	17000
<b>Brazil</b>	<b>29000</b>	<b>16000</b>
Russia	25000	14000
China	23000	7200
India	7000	4500
Venezuela	4000	2400
Ukraine	6500	2300
Canada	6300	2300
Sweden	3500	2200
United States	6900	2100

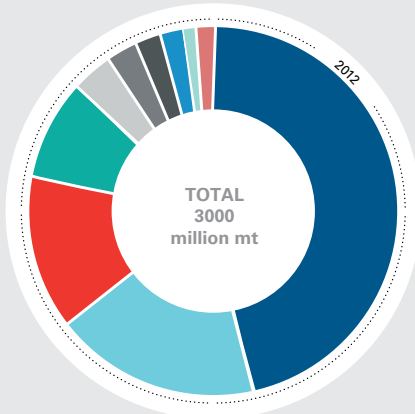


## Iron Ore Production by Country

Source: USGS



COUNTRY	2011	2012
China	1330	1300
Australia	488	525
<b>Brazil</b>	<b>373</b>	<b>375</b>
India	240	245
Russia	100	100
Ukraine	81	81
South Africa	60	61
USA	55	53
Canada	34	40
Iran	28	28





## INTERVIEW WITH

Paulo  
Castellari-PorchiaCHIEF EXECUTIVE OFFICER  
ANGLO AMERICAN IRON ORE BRAZIL

Minas Rio boasts very good quality ore and a final operating cost that will allow it to be very competitive on the market. Could you tell us more about the overall quality of the project and its main advantages?

Minas-Rio is a very large deposit and by now, we have identified at least 5.77 billion tons of ore, and there is good potential for this number to be increased in the future; out of these, we have certified 1.45 billion tons. The quality and the chemical nature of the ore is very good – it is very soft, easy to crush and float and the final pellet feed, which will have a grade of around 68%, will have very low contamination. Another competitive advantage that we will have on the market is related to the low operating costs that Minas-Rio will have. Due to the tough decisions that we had to make regarding investment and our commitment to executing a long term and quality project, we are looking today at \$ 30 per ton at the port and anywhere between \$ 45 and \$ 55 per ton delivered in China. Minas-Rio was conceived having in mind three development phases: the first will allow us to produce 26.5 million tons per year, after which we will undergo an optimization and ramp-up period to 29.8 million tons per year. Phases two and three would ultimately allow us to add another 30 or even 60 million tons of production, as Minas-Rio was designed to sustain up to 90 million tons per year. Even today, Anglo American has teams that are working on prefeasibility studies for these latter phases, but developments on this front will not occur before 2016 or 2017. Anglo American's main priority right now is to prove to ourselves and to our shareholders that we can bring Minas-Rio into its initial production stage and that we can ramp it up successfully; that will allow us to gain the confidence needed to move forward.

Minas-Rio is a complex integrated project that incorporates a 525 km pipeline and a dedicated

port. Could you guide us through the state of development of each of these components?

Today, MinasRio is 65% complete overall: land access in critical areas such as the mine and plant has been achieved and very good progress has been made at the pipeline as well. Currently, we are entering a very important phase, the electro and mechanical erection phase. At the site, most civil works have been completed and at the port, the two stackers and the reclaimer are already in place. Earthworks are in progress and they will continue both at the plant and at the pipeline. The port that we have is actually a joint-venture with LLX, the logistics arm of the EBX group and it is called LLX MR (Minas-Rio). TX1 is one of the terminals of the larger Acu Superport and since the very beginning this terminal was designed to be dedicated to Anglo American's project. The terminal is now 58% complete, with all onshore facilities complete. Anglo American has a very good relationship with LLX; we are managing the building process and all that is left now is the building of the breakwater.

The 525 km pipeline that links our mine with the port is another component of Minas-Rio and the biggest issue that we have had with this had to do with land access and making sure it was track open. Not having open track in front of us caused discontinuity of the process and bottlenecks and this was one of the problems that we had to solve during our restructuring of the project. Right now, we are 73% complete with the entire pipeline and over 50% of it (270 km) is laid and buried, with farming activities taking place on top of the pipeline already. This pipeline does not only offer Anglo American the competitive edge in point of operating costs, but it also represents the ideal solution from an environmental perspective. Our good results were also made possible by the very good collaboration with our partner Camargo Correa, a company that we have worked with for Anglo American Nickel's Barro Alto as well.

With such a large project and footprint, what is Anglo American doing in point of environmental and corporate social responsibility policies?

Minas-Rio has been a very interesting journey for Anglo American and our efforts have been aimed at adapting and integrating the legacy that we received with our world-class CSR policies. We have over 13,000 people working on our project and the pipeline alone is responsible for over 120 work-fronts at any given time. Anglo American has been on the FTSE and the Dow Jones Sustainability Indexes over the last 10 years and we have a dedicated team to ensure that we are working responsibly across all these fronts. At Minas-Rio, we are looking not only at the building component, but also at the operating one, an aspect which is essential but sometimes forgotten in our industry. Anglo American looks at the entire value chain and based on the environmental impact study we select the priorities on which to focus. We need to understand what the communities want but we also need to suggest solutions back to them. Minas-Rio has 9,000 people working in Conceicao now and when in operation, we will be employing 5,000 people at Conceicao alone (3,500 direct and 1,500 contractors). According to a study that we developed in partnership with BNDES, this will generate 8,000 indirect jobs in the region. Integrating and adapting elements from our successful policies at Zimele, we have developed a supplier development program called PROMOVA, in order to help develop these indirect businesses. We are also adding capacity to the communities that we interact with through our MOVER program: by using buses as mobile training units, we are offering 40 free courses that can be taken online or in person to all members in the communities that Minas-Rio comes into contact with. Overall, by the beginning of 2014, we will have invested BRL 100 million in social initiatives at Minas-Rio. •

“Minas-Rio has been criticized severely in the past but no project as good as this comes easy. Anglo American has implemented systems and pre-warning procedures that allow us to stay ahead of the curve and anticipate problems; we have learned from the past and we are very well prepared to deal with any challenge that might be ahead of us now. Today, we are in a different place and Minas-Rio will be an extremely robust contributor to the group, and the mining industry in Brazil,” said Castellari.

Meanwhile, a company that has experienced a lot of turbulence lately has been MMX, Brazilian tycoon Eike Batista's mining business, part of the EBX group. Batista, who lost over \$30 billion in personal wealth since March 2012, stepped down as chairman of MPX Energia in July, further increasing worries about the financial health of his EBX Group, which saw its shares dropping 64% in 2013. MMX accounted for 7.4 million mt of iron ore in 2012, which were produced in its Serra Azul mine in Minas Gerais and in its Corumba mine in Mato Grosso do Sul, and future plans were to ramp-up total production to 40 million mt/y, through the addition of a processing plant of 29 million mt/y at the Serra Azul site. However in July, with Batista's recent financial troubles, operations at Corumba were suspended for at least six months, a fact which has raised doubts about the future of MMX. The company declared in late June that it was in talks to sell a stake or assets to companies like Glencore Xstrata. Another EBX key mining related investment is the Acu Superport, an investment of roughly \$2 billion located in the north of the state of Rio de Janeiro, started by LLX (EBX's logistics arm) in 2007 and scheduled to begin operations in the second half of 2013. At full capacity, the port would be able to handle 350 million mt/y of imports and exports, which would make it the world's third largest facility of its kind. Capable of accommodating even Valemaxes, the port will have two terminals, TX-1 (offshore) and TX-2 (onshore); TX-1 is being developed by an LLX/Anglo American joint venture called LLX Minas Rio and will be Anglo American's Minas Rio's dedicated port terminal. However, the strong financial tremble experienced by Eike Batista and implicitly, his empire, has cast a long shadow over all of EBX's associated busi-

nesses and now, only time will tell if the market will maintain confidence in EBX's projects. Several juniors such as TSX-listed Talon Metals (with its Trairao Iron project, in the state of Para) and ASX-listed Centaurus Metals (with its 2 million mt/y Jambreiro project, in the state of Minas Gerais) are moving ahead with significant iron-ore projects in Brazil: among these, SAFM (South American Ferrous Metals) is a perfect example of a junior looking to make big moves. The only ASX-listed pure-play iron ore producer in Brazil, SAFM currently produces lump, sinter and concentrate at its Ponto Verde project, located in Minas Gerais' Iron Ore Quadrilateral. “We currently have a license for 1.5 million tons of iron ore per year and our processing plant involves a two stage crushing and screening circuit. SAFM has a monthly production of 25,000 mt of sinter, 20,000 mt of small lump per month, and 20,000 mt of concentrate, mainly accounted for by Namisa at the moment. Our sinter feed and small lump have a grade of around 60%, with 0.9% phosphorous and our concentrates have a final grade of approximately 64.5%, with a low 0.5% phosphorous level and 2.5% of silica. Until now, we have had two JORC resource statements done and according to the latest one, SAFM's resources amount to 300 million mt of 40.7% iron ore, of which 175 million mt is measured and indicated,” said Jose Marcio Paixao, chief development officer of SAFM.

With operational costs at \$15 to \$19 per mt and with a projected mine life of around 20 years, SAFM is aiming high and it plans to achieve a capacity of 8 million mt/y by the end of 2015.

Another ASX listed junior is Crusader Resources, which owns a series of gold, tungsten and iron projects across Brazil. Crusader's Posse Iron Ore project, located in Minas Gerais, has a mineral resource of 36 million mt at a 43.5% Fe grade. Posse received a license to operate from Brazilian authorities for a trial 300,000 tpy throughput arrangement in late 2012 and now, Crusader is undergoing a ramp-up of its operations at the site, after it was awarded the environmental approvals necessary for a full mining license in May 2013. It was not all smooth sailing though, as the project saw an injunction being placed on it in late June 2012. “While we were dis-

appointed that the injunction was served in the first place, we were really pleased that we were able to overturn it so quickly, in a matter of days. Now, the ramp-up at Posse is meeting all expectations and we are pushing the application for a full mining license as per our previous guidance,” said Robert Smakman, managing director of Crusader Resources. With sales of 18,000 mt of lump in June going to the likes of Gerdau and ArcelorMittal, Posse seems to have the gained traction for future development.

Lastly, a player worth noting is Sul Americana de Metais, a company that is looking to develop its Vale do Rio Pardo project to a capacity of 25 million mt/y, with production scheduled to start in the second semester of 2015. “We are looking at an integrated project that will have an investment value of \$3 billion and a mine life of 25 years. During the construction phase of the whole project, we estimate we will have roughly 9,000 direct workers while during operation, we will be employing 2,000. Sul Americana de Metais will be investing in a pipeline (1.5 meters average depth) that will connect our mine in Minas Gerais with the port from which we will be exporting our pellet production to China; the port will be built by local authorities in Aritaguá, in the state of Bahia,” said Haroldo Fleischfresser, CEO of Sul Americana de Metais.

IBRAM data suggests Brazilian iron ore production will increase its capacity with 451 million mt between 2011 and 2016 and that iron investments will equate \$46 billion until 2016. With prices slowly recovering (average of \$137 per mt for the first half of 2013), and with China and India continuing their growth and urbanization, demand will still be there but only the best will be able to seize it. “If you look at the global trends right now, it is obvious that China will continue to dictate demand for iron ore through urbanization and steel consumption per capita. Right now, we see a lot of production for iron ore coming out and while demand has decreased, we are still looking at 2.5% to 3.5% CAGR for the next six years, which is still a good level. The challenge will be for this new capacity, which is often of lower grade material and more expensive to be produced to actually become viable,” said Paulo Castellari of Anglo. •



## INTERVIEW WITH

# José Márcio Paixao

CHIEF DEVELOPMENT OFFICER  
SOUTH AMERICAN FERRO METALS (SAFM)

What is the current stage of development and what have been the main developments and milestones at the Ponto Verde Iron Ore project that SAFM has achieved during 2012 and the first half of 2013?

SAFM's Ponto Verde project is already in the production stage and although our volumes are not very high yet, the advantage is that we are managing to sell all of our iron ore. We currently have a license for 1.5 million tons of iron ore per year and our processing plant involves a two stage crushing and screening circuit. SAFM is producing 25,000 tons of sinter feed per month, which is mainly sold to Namisa, and 20,000 tons of small lump per month, which is sold on the pig iron markets in Brazil. As of April 2012, SAFM is operating a medium intensity magnetic concentrator that is responsible for 20,000 tons of concentrate per month, mainly accounted for by Namisa at the moment. Moreover, SAFM is in the process of commissioning a new concentrator, a high intensity magnetic separator that will produce high grade concentrate at a rate of 20,000 tons per month. Our sinter feed and small lump have a grade of around 60%, with 0.9% phosphorous and our concentrates have a final grade of approximately 64.5%, with a low 0.5% phosphorous level and 2.5% of silica. Before the beneficiation, our ore has a 53-55% grade, but we are currently working with surface material mainly. SAFM has underwent three drilling programs for a total of 10,000 meters so far with various companies, our last partner being Geosol, which was responsible for 3,500 meters of the total works. Until now, we have had two JORC resource statements done and according to the latest one, SAFM's resources amount to 300 Mt of 40.7% iron ore, of which 175 Mt measured and indicated. Our company's current focus is now on the bankable feasibility study required for the expansion of the project to a capacity

of 8 Mt per year, process which is supervised by Logichem. However, SAFM is working with various other companies such as Coffey Mining for the geotechnical part, Golder Associates for mine planning and the local SEI Engenharia for engineering purposes. This bankable feasibility study was started in April 2012 and despite the challenges associated with conducting this complex process, SAFM is confident that it will be able to finalize it by this December. On the environmental side, we have a very good traditional relationship with the local environmental licensing agencies and we are expecting positive results for the permits for the expansion of the project.

What was the reasoning behind the production goal of 8 Mt per year at Ponto Verde and what is the timeline for achieving this objective?

SAFM's initial plan was to undergo a 3 Mt per year operation that would expand to 6Mt, but after making a desktop study with Coffey Mining, we decided that given the space that we had for waste and tailing, an 8Mt per year operation would be the best to work with. Our long term future plans also involve a further expansion to 16Mt per year but the accomplishment of that goal also depends on our negotiations with VALE, which owns the other half of the mountain where Ponto Verde is located. Currently, our bankable feasibility study is only considering SAFM's own assets, and the pit we have in mind is exclusively for our project. However, a potential deal with VALE to unite the two assets is currently under negotiation and many benefits could arise from it, such as reduced operational and environmental costs and SAFM's philosophy is very well aligned with that of VALE's. Ponto Verde's current operational costs are approximately between \$ 15-19 per ton and our mine-life, considering only our tenement, is of 16 to 20

years; however, if the negotiations with Vale will be successful, and we will unite projects, we are looking at a mine life of 30 years.

What are the current market fundamentals for iron and is SAFM looking at other assets apart from Ponto Verde?

China's economic slowdown took its toll on prices for iron ore and on the 15th of September 2012, the price was down to \$ 86 per ton. A recovery seems to be occurring and generally speaking, the market is optimistic about it, but we are being cautious when it comes to our expectations. Nonetheless, the global economy will recover, and while the most positive predictions talk about a price of \$ 130 per ton, we are satisfied with the current level of \$ 125. SAFM is always on the lookout for new projects and we are always receiving offers in that sense, but iron ore mining has its specific challenges and only about 0.5% of all the suggestions we receive make economic sense.

What is the mid-term and long term future vision for SAFM and what will be the main highlights of the year 2013 for the Ponto Verde project?

For SAFM, the year 2013 will bring the operation of the new concentrator into play as well as the finalization of our bankable feasibility study, which will be followed by several audits; additionally, we hope to receive all of our licenses for the expansion project and we are also planning a new drilling program, depending on the information that VALE will be supplying to us. Our vision for now is to focus on the expansion program and the negotiations with VALE for the unification of the two assets and we are optimistic about our future in this respect. •



Courtesy of Vale

# To Casear What is Caesar's

A special report on Vale

Founded in 1942 by the Brazilian Federal Government and privatized in 1997, Vale is currently the world's third largest diversified mining company. With operations in over 30 countries and revenues of \$46.4 billion in 2012, Vale leads global iron ore and pellet production and ranks second in terms of the world's nickel output. In 2012, the Brazilian mining titan accounted for 320 million mt of iron ore (down 0.8% compared to 2011) and 237,000 mt of nickel (down 1.9% compared to 2011), productions that engendered 78.2% of Vale's gross operating revenues during the year. However, these slight drops in output do not fully paint an accurate picture of the challenging global environment that Vale had to face in 2012. China, which accounted for 36% of Vale's overall sales last year, has been the world's main driver for minerals and metals in recent times, and with its economic slowdown to 7.8% in 2012 compared to 9.2% in 2011, Vale inevitably suffered. This development and the unpromising general global economic climate drove down steel demand and implicitly the price of iron ore, which plummeted to a record low \$99 per mt in September 2012. Meanwhile, worldwide nickel output has been aggressively increased over the last years, with China at the forefront of this development, raising its production by 390,000 mt/y between 2006 and 2012, putting further pressure on nickel prices. Nonetheless, Vale continued to invest strongly last year; with a global capital and R&D budget of \$17.7 billion, it managed to obtain a total of more than 100 environmental licenses for its projects. Now, in 2013, with iron ore prices slowly recovering, Vale is concentrating its efforts on several key projects that are impressive in terms of size, operating costs and quality, allocating a total capital and R&D budget of \$16.3 billion for the year (out of which \$1.58 billion for R&D and \$ 1.1 billion for CSR initiatives). The spotlight of the company's investments for 2013 is taken by S11D, the largest single iron-

ore project in mining history, which will add 90 million mt/y of capacity to Vale's Carajás operations through the construction of a mine and of a plant that are scheduled to start operating in 2016. Still within the Carajás complex, and with a projected start-up date in the second half of 2013, is the "Additional 40" program, which involves the construction of an iron ore dry processing plant with a capacity of 40 million mt/y. When completed, these two will increase Vale's iron output in Carajás to 230 million mt/y and in order to sustain that, the company has already put into place an impressive logistical expansion. CLN 150 is scheduled for completion in 2014, and will expand the railway and the Ponta da Madeira Port (Maranhao) of Vale's Northern Logistics Corridor to support a nominal capacity of 150 million mt/y; the second stage, named CLN S11D, will allow a further logistics ramp-up that will fully accommodate the final 230 million mt/y regional production. Moving south to Minas Gerais, in Vale's southeastern system, there are four projects that will receive increased attention in 2013: Conceicao Itabiritos will involve the construction of a 12 million mt/y concentration plant (100% pellet feed), scheduled for start-up in late 2013, while Conceicao Itabiritos II, a program projected for completion in late 2014, entails the adaptation of a 19 million mt/y facility (31.6% sinter feed / 68.4% pellet feed) to process low grade itabirites. Finally, Vargem Grande Itabiritos, with its 10 million mt/y concentration plant (100% pellet), scheduled for early 2014, and Caue Itabiritos, with its 24 million mt/y plant (29% sinter feed / 71% pellet feed) planned for start-up in 2015, constitute the last of Vale's major investments in iron ore in Brazil in 2013. Other domestic investments that are worth noting are the Salobo II expansion which will add 100,000 mt/y of copper capacity to the project by mid-2014 and the construction of Vale's eighth pellet plant (7.5 million mt/y capacity) at its Tubarao Port in the state of Espirito Santo.

On the international scene, the Nacala corridor in Mozambique, scheduled for completion in 2014, will allow Vale to have a railway and port system that will process 18 million mt/y of coal; furthermore, the company is also increasing its Moatize capacity with a project called Moatize II, which has its start-up projected for 2014 and a planned nominal output of 11 million mt/y. Moreover, Vale's global nickel operations will receive a boost from the Canadian Totten and Long Harbor developments that will encompass the re-opening of an 8,200 mt/y mine and the construction of a 50,000 mt/y hydrometallurgical facility.

Taking the meaning of an integrated project to a whole new level, Vale engaged in 2008 in the acquisition of 35 of the largest Very Large Ore Carriers (VLOC) ever built. Generically called Valemax, these bulk carriers have a capacity of 400,000 mt deadweight each and represent Vale's attempt to further lower its operational costs (with 20% to 25%) and to better compete with Australian exporters, which have a much shorter trade route to China. Generating 35% less CO<sub>2</sub> per mt than traditional Capesize ships, the Valemaxes so far have not benefited from smooth sailing however. Pressured by national shipping firms and steel producers worried about the impact these ships would have on iron ore prices and supply, China banned the Valemaxes from docking in its ports in late 2011, a development which led Vale to organizing intermediate ore deployments into traditional Capesize ships in Malaysia over the past years. However, in April 2013, the eastern Chinese port of Lianyungang allowed a Valemax to unload its 220,000 mt cargo on its site, potentially opening the door to a resolution to this controversial issue.

The year 2012 was not without challenges for Vale and the worldwide drop in mineral prices undoubtedly affected Brazil's mining titan. Simultaneously, big potential programs such as the potash Rio Colorado in Argentina and the iron Apolo in Minas Gerais have been put on hold or given up on. This being said, Vale's strong positions worldwide have allowed the company to start seeing profits in 2013 based on cost reductions. Furthermore, the bounce-back of commodity prices (\$137 per iron ore mt average for first half of 2013), as well as the Brazilian real's depreciation by more than 10% during the year have already greatly helped Vale. And with strong investments in R&D, such as S11D's truckless system, which contribute to the project's impressive \$15 opex/mt, Vale looks good to grow again. •

## INTERVIEW WITH

# Katsuo Dias Homma

MANAGER OF INTEGRATED PROJECTS FERROUS, STEEL AND LOGISTICS  
VALE

*S11D is the largest project in Vale's history and it will add a capacity of 90 million mt of iron ore to the company's annual production. Could you give us an overview of this integrated project and its components?*

S11D, which is located in the Carajas complex in the state of Para, is the largest project that Vale ever engaged in during its history and when completed, it will help us add 90 million mtpy to our overall iron ore production in Para, which at that point will amount to 230 Mtpy. The Carajas area has several ore bodies that have great promise, but the work we are currently executing at S11D is focused on ore body s11, block D, which has proven reserves of 2.78 billion mt of high grade iron ore content (66.7%). One of the main qualities that S11D has is its very competitive OPEX of \$15 per ton, performance that comes from the huge scale of the project itself but also from the synergies that we have in place with our already existent operations in Carajas, and the Northern Corridor Logistics program that we have recently completed. The Northern Logistics Corridor Program, also known as CLN 150, allows Vale to expand the logistics capacity of its Carajas operations to 150 million mt per year, and we have already obtained the operating permit for it earlier on this year, in April. For the purposes of S11D, we are supplementing the CLN 150 project in order to reach a total logistics capacity of 230 million mt per year; this new project, that is currently in the works, is called CLN S11D and it involves new railways, the duplication of most of our existent ones and new onshore and offshore capacity at our Ponta da Madeira port terminal, in Maranhao. Moreover, Vale is currently undergoing operational simulations in order to optimize the timing and the schedule of the trains that we have running on the Carajas railway. Additionally, we are also looking at ways to increase the numbers of train wag-

ons in place, all with the purpose of creating an even more efficient transportation system; these improvement processes will continue to happen, as more and more capacity is added in terms of logistics, given the future duplication of the railways. Overall, with S11D, we are looking at an integrated project with a total capital expenditure of \$19.671 billion, out of which \$8.08 billion is accounted for by the construction of the mine and of the beneficiation plant while the other \$11.58 billion will go into CLN S11D.

*Vale received two very important environmental installation licenses this year for S11D. Could you tell us more about that and about the experience that you had in terms of sourcing labor for this massive project?*

Vale has a lot of experience when it comes to licensing processes within Brazil and we have developed a strategy that takes into account the various parts of the project, such as the logistics and the mining components. We already have the operational license (LO) for CLN 150 and we are building on that to help us with CLN S11D. Earlier on this year, in May, Vale received the environmental installation license (LI) for its 101 km branch railway line that will connect S11D to the Carajas Railway. On the mine and processing plant front, we are doing very well due to our decision to build modules outside of the construction site in the Carajas National Forest. These modules will then be transported to the site itself and as of late May this year we were 44% done with the physical progress for these; by the end of the year, we are hoping to build as many as 40 modules. Receiving the installation environmental license (LI) for S11D was a very important milestone for us and from now on, we will be able to move at a much faster rate. Sourcing labor is a problem in Brazil, but Vale is very well equipped to deal with this reality,

especially in the State of Para, where we already have operations running in the Carajas mines. Moreover, our Additional 40 program, which will add a capacity of 40 Mtpy to our Carajas operations, is also being completed, so we have a lot of labor in the area right now. Nonetheless, building railways is labor intensive and we will need to bring even more people but we are confident that this will not represent a major obstacle for us.

*Could you tell us more about the growing importance that the state of Para has for Vale and about your organization's efforts to develop the communities that are located close to its S11D project?*

The state of Para is essential to Vale, as part of our northern system, which also comprises the state of Maranhao. This area, alongside the southern system that we have in Minas Gerais and Espirito Santo, is the largest contributor to the production that we achieve and Vale is very well positioned in both the north and the south of Brazil, where we have integrated railways that improve our efficiency and operational costs. We also try to contribute as much as we can to the development of these regions, not only through the taxes that we pay to authorities, but also through the investments we make in the local communities. Vale has a long standing policy of using local suppliers and it is important to mention that we do more than just passively influence the area: in partnerships with private sector associations, we actively go about training and offering help to the communities around us, thus making our contribution to the establishment and the nurturing of social infrastructure, social welfare and new businesses. At the peak of construction work, Vale will have 30,000 people working in this project and it is important for us to make it clear to them that S11D will have different stages of impact and employment,

according to the phase of the development, construction or operating. The overarching goal that we have is to create a good relationship between the people and the authorities involved and Vale.

*S11D is impressive not only in terms of its size, but also when it comes to the technological innovations it employs, such as the truckless system and the large-scale conveyer belt. Could you detail these for us and give us an overview of what the benefits of using such technologies will bring to the project?*

S11D has several characteristics that make it stand out in terms of technological innovation. To begin with, our operations will not involve trucks, as these will be replaced by a system composed out of excavators and mobile crushers that will feed the iron ore to the 37 km conveyer belt that will ultimately reach the beneficiation plant. This means less workers, less usage of equipment, dramatically less fuel usage and improved worker safety. Vale is even using the iron ore movement on the conveyer belt to generate electricity which then gets recycled and used for the operation of the belt itself. The truckless structure is one of the main factors that will enable us to have a low operating expenditure and from an environmental perspective this will help Vale reduce its carbon footprint with roughly 140,000 mt of CO<sub>2</sub> emissions per year. In terms of obstacles in our way to building this system, the different heights of the conveyer belt segments, as well as managing the heavy weight that they needed to withstand were the main issues that we had to solve and in the end we managed to do so. The other major technological breakthrough present at S11D is the dry processing method that will be used; by using the natural moisture and the humidity of the Amazonian forest, Vale will be able to avoid several electrical and fuel costs related to the

beneficiation of the ore and will further mitigate its environmental impact in the region. Dry processing alone will be responsible for saving 18,000 MW of energy per year and overall, Vale is looking at 93% water usage reduction and a 77% fuel consumption decrease once operations will be running at maximum capacity at S11D.

*Which areas of S11D will Vale focus on for the rest of the year and what is your final message regarding the significance of the project to the company and the industry, as a whole?*

In terms of the mining and the beneficiation plant works, our current main focus is on building the modules in the off-site region and on putting the finishing touches on the 42 km road that will allow us to transport them to the mine site; on the logistics front, we are now concentrating on laying down the new branch railway, from S11D to the Carajas line. These will be the main developments that Vale will be pursuing during the remainder of the year and we are very positive about the progress we will be able to achieve. S11D is a landmark project not only for Vale but for the industry as well: its scale, quality, and technological innovations make it a game changer that will positively impact the market and our clients, who will benefit from high grade ore at very competitive prices. •





# Nickel

## Good demand ignites overcapacity

Nickel producers have not had the best couple of years. Just over two years since prices of the base metal peaked at around \$13/lb in February 2011 (which still fell short of its pre-global financial crisis heights), the price has now dropped to below \$7/lb.

Global excitement surrounding nickel has led to the market supply surpassing global demand growth rates and this development, along with a weak worldwide economic performance in 2012, has pushed nickel prices down. “Global economic growth is closely tied to the consumption of stainless steel, which is produced using nickel. When the world economy is growing, steel consumption thrives, but when it is doing poorly, consumption of steel and therefore nickel declines alongside it. Although global nickel consumption grew by 6.7% and 3.9% in 2011 and 2012, respectively, and production rose by about 6% in both years, price declines meant that producers were left with year-end surpluses of 51,000 mt in 2011 and 33,000 mt in 2012. Analysts forecast that the demand and supply for nickel will balance out in 2013, leaving a surplus of only about 3,000 mt. Unfortunately, nickel prices have not yet reacted to the increase in demand. The best nickel prices usually occur at the beginning of the year, but we did not see this play out in early 2013,” explained Walter De Simoni, CEO of Anglo American Nickel.

Yet after a long wait, producers now have cause for optimism. A slight recovery in August could be the start of a far larger revival, with a supply-demand deficit pointing to a longer-term price increase. “By the end of 2014, analysts expect a deficit of 12,000 mt of nickel, which should put upward pressure on prices. Consumption is also expected to rise by 6.6% in both 2013 and 2014. Most analysts say nickel prices will start to pick up around 2015, reaching a peak at 2020,” said De Simoni.

With an output of more than 85,000 mt of

nickel in 2012, ranking among the top 10 in the world, this is good news for Brazil. The country is home to all of Anglo’s nickel operations, and recent years have seen major changes occurring in the field for this global mining player. Anglo’s Venezuelan site of Loma de Niquel was refused a permit and concession renewals by the Venezuelan government in 2012, a fact which led to the permanent cease of activity at the 13,000 mt/y site. This development left Anglo Nickel with only two major operations, both in Brazil. The first is Codemin, a site in Niquelandia (Goiás), where the company has been producing nickel since 1982, and the site saw 9,600 mt/y of output in 2012. However, delivered on time and on budget, Anglo American’s new rising star is its other Goiás project, named Barro Alto. With a projected mine life of 26 years and with an expected average production of 36,000 mt/y, the project required investments of \$1.96 billion and produced 26,000 mt in 2012. This year, after solving problems with equipment suppliers for its electric furnaces, Anglo is targeting to ramp-up production to the nominal capacity of 41,000 mt/y. Furthermore, the company has two more long-term projects in sight; Morro Sem Bone and Jacare, which would potentially add another 66,000 mt/y capacity for Anglo American Nickel.

The largest electrolytic nickel producer in Latin America, Votorantim Metals, owns three sites in Brazil that account for a total output of 44,000 mt/y. “Regarding nickel, although we are not a huge producer on the world stage, our production positions us comfortably between the seventh and 10th largest producers in the world. Votorantim was founded by experts in the metallurgical field who viewed the mine as nothing more than a supplier of raw materials to the processing facilities. However, with the exception of some of the finished products that our aluminum unit manufactures, there is much more profit to be found in the mining than in

the transformation process and we are planning a shift in this direction,” said Tito Martins, CEO of Votorantim Metals.

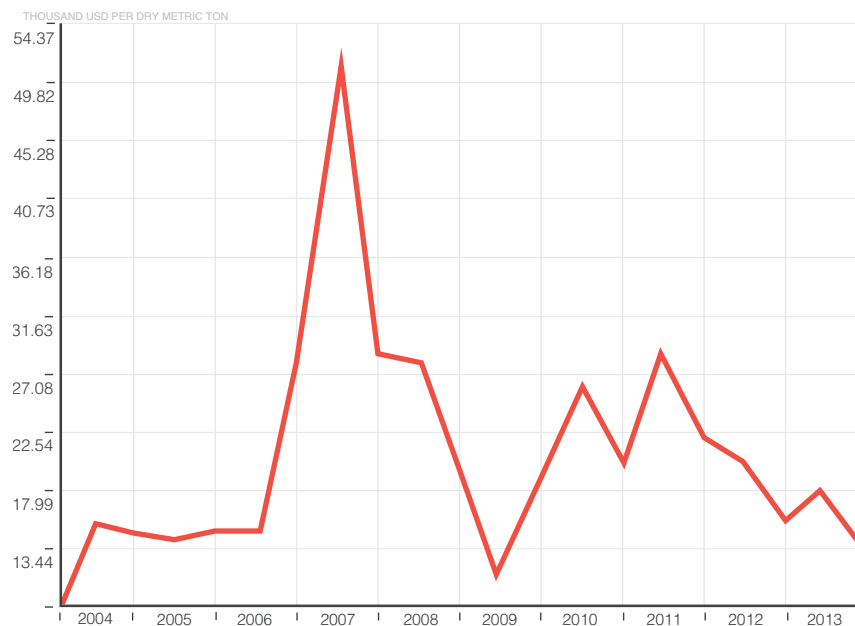
Operations in Niquelandia (Goiás) and in São Miguel Paulista (São Paulo) commenced in 1981 and these two assets today are responsible for 25,000 mt/y; Fortaleza da Minas is Votorantim Metals’ third site, and the 2003-acquired operation accounts for a further 19,000 mt/y of sulfide ore nickel.

Vale, the world’s second largest nickel producer with a total output of 237,000 mt in 2012, only has one operation of the kind in Brazil: Onça Puma, located in the state Pará. A lateritic project using a pyrometallurgical process, Onça Puma is intended to have a final nominal capacity of 53,000 mt/y but problems with its furnaces led Vale to put the ramp-up of the project on hold in June 2012. Nonetheless, Onça Puma produced 6,000 mt of nickel in 2012 and the company plans to have the asset back on track in late 2013.

Furthermore, Brazil also hosts a number of juniors trying to develop nickel assets and one good example is represented by Horizonte Minerals, an AIM and TSX listed company focused on the Araguaia Nickel project in Carajás. The asset, which was acquired in 2010 from Teck Resources and consolidated with the integration of the Vila Oito and Floresta nickel laterite projects (bought from Lara Exploration), is in its prefeasibility study stage. “We will take 12 to 18 months to complete our bankable feasible study, and there will then be another 12 to 18 month construction period. Ideally Araguaia would enter production in mid-to-late 2017. Brazil has two or three nickel projects being developed, and there will be a period of two or three years of oversupply as they reach capacity, but from 2016 or 2017 underlying demand will outstrip supply here, as not many new projects will be developed after the current wave,” said Jeremy Martin, CEO of Horizonte Minerals. •

## Nickel Prices

Source: The Steel Index

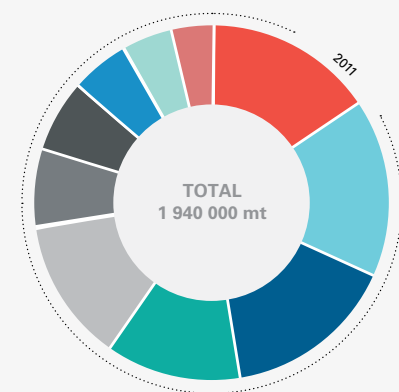


China is responsible for 42% of gross nickel consumption globally, but it used to produce over 70% domestically, with the remaining 30% shared among the world’s producers. However, in terms of per capita nickel consumption, China lags behind Japan and Europe. In Europe, the largest per capita nickel consumer is Germany, and in Asia it is Japan. There is a huge opportunity to increase nickel consumption globally, and most analysts forecast a nickel deficit around 2022 to 2025.

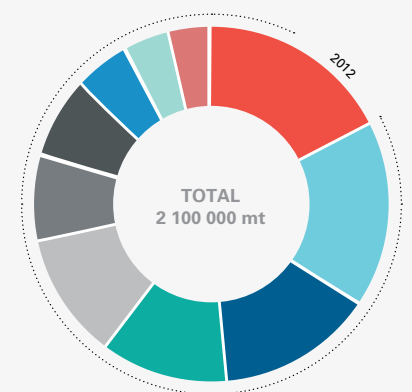
- Walter de Simoni,  
CEO, Anglo American Nickel

## Nickel Production by Country

Source: USGS

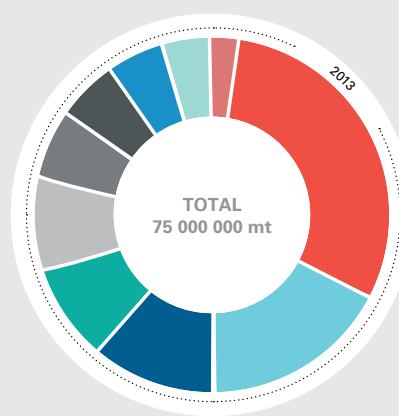


COUNTRY	2011	2012
Philippines	270,000	330,000
Indonesia	290,000	320,000
Russia	267,000	270,000
Australia	215,000	230,000
Canada	220,000	220,000
New Caledonia	131,000	140,000
<b>Brazil</b>	<b>109,000</b>	<b>140,000</b>
China	89,800	91,000
Colombia	76,000	80,000
Cuba	71,000	72,000



## Nickel Reserves by Country (2013)

Source: USGS



COUNTRY	RESERVES
Australia	20 000 000
New Caledonia	12 000 000
<b>Brazil</b>	<b>7 500 000</b>
Russia	6 100 000
Cuba	5 500 000
Indonesia	3 900 000
South Africa	3 700 000
Canada	3 300 000
China	3 000 000
Madagascar	1 600 000

## Expected Nickel Production Growth to 2016

Source: IBRAM

	1000 TONS
Production in 2011	70
Increments by 2016	30
Expected Production by 2016	100
Change	43%

## Investments in Nickel to 2016

Source: IBRAM

	BILLION USD
2011- 2015	6 550
2012- 2016	3 345



INTERVIEW WITH

# Tito Martins

PRESIDENT  
VOTORANTIM METAIS

2012 was a difficult year for the Brazilian mining industry, and for base metals all around the world. How did Votorantim Metais fare last year and what strategies are you pursuing to take the company forward?

It is certainly true that 2012 was a tough year for Brazil's mining industry, and also for the commodity producers all over the world. We suffered as a result of the poor domestic market conditions, the drop in metal prices and some internal issues that the company was facing. This forced us to cut back on some of our important long-term investments in new projects and interrupt the development of some new processes we were working on. As a consequence of this, production levels across all minerals experienced a slowdown. Today, however, the situation has changed. Although we are still having to deal with low commodity prices, we have made great steps forward in other areas: production of aluminum is back to previous levels, we have implemented several new processes in our zinc transformation plants which has led to a greater level of productivity, and we have increased production of nickel after having adapted our processes to deal with more imported concentrate. Looking at Milpo in Peru, we are also doing well, having increased ROM production at the Cerro Lindo mine from 10,000 tons per day to 15,000 tons per day. Thanks to all these developments, I believe that if prices were at their previous high levels, this would be a record year for Votorantim Metais.

Votorantim Metais is investing R\$6.6 billion in a new mine and bauxite processing plant in Rondon do Pará. Could you provide us with some more details on this project?

Rondon do Pará is a key project for Votorantim Metais. Today we are completing the final feasibility study and engineering, and are hoping to have this finished by the end of 2013 so that we can begin construction in 2014. The project

boasts over one billion tons of high quality bauxite reserves with very low silica content, and we have decided to build an alumina refinery at the mine site itself. As for logistics, our original plan was to transport aluminum from the mine to the port by road, but we have recently heard that the extension of the Norte-Sul Railway from Maranhão to the Bacarena Port in Pará will pass very close by our site. The plan is for the railroad to be completed by 2016, which fits perfectly with our vision to have the Rondon plant running in early 2017. As for port availability, we are in contact with the state authorities in Pará and have secured a vacant area in the Bacarena Port that we can use for our needs. The project is located in a fairly underdeveloped area between three large cities, and it will bring several social and economic advantages to the region, generating 6,000 jobs during construction and 1,600 jobs in operations.

Now that the company is starting to focus more on mining, will you be placing more importance on the exploration team?

At Votorantim Metais we recognize the importance of developing a strong exploration team, and we have already been spending between \$60 million and \$75 million per year on this area. In times like this, when prices for metals are falling, many companies begin to cut back on their research and exploration budget. We believe this to be a poor strategy, as it is our geologists and their work that builds the future of the company. Rondon do Pará, for example, was an in-house discovery that we have worked with from the ground up.

What is your opinion on the contents of Brazil's New Mining Code and the effects that it will have on the industry?

Firstly, the provisions given for the transformation period are very good, and we are thankful for this because there was a fear in the industry

that the new measures would be imposed with no time for adjustment. It is not yet clear what the eventual effects of the new code will be, and it could take up to two years for the laws to pass through Congress. We are concerned about the proposals for the new auction system to grant concessions as we believe it could deter investors away from the country. The royalties were always bound to increase, but the commonly heard assertion that royalties in Brazil are much lower than the world average is misleading because of the plethora of additional other taxes that miners have to pay here. There is now discussion in Congress of compensatory measures that would take the form of reductions of other taxes, which is positive, but there was no mention of this in the original draft. The creation of the ANM could be a very positive move for the country, as the DNPM already functions in a similar way to an agency and the formalization of this status will give them more resources to work with.

How do you see the market for base metals developing in Brazil and what is your vision for the future of Votorantim Metais over the next five years?

Here at Votorantim Metais we are optimistic about the future. It is true that commodity prices are not good today, but they should begin rising as demand increases again. Base metals will struggle compared to bulk commodities as the margins are much lower, but I believe that we will see a shift in the cost structure of new projects that will mean mines operating with a higher opex will still be profitable. As long as we can develop new resources, even at a high cost, I believe that the market will reward us. As for the future of Votorantim Metais, today we are one of the largest players in the Brazil. We are one of the largest players in South America. In five years we want to enjoy this status worldwide, and we are confident that this is possible. •



INTERVIEW WITH

# Walter De Simoni

CHIEF EXECUTIVE OFFICER  
ANGLO AMERICAN NICKEL

The year 2012 was not without challenges for nickel producers. What were the impacts of the financial climate on the nickel business and to what extent is the sector expected to recover in the future?

Global economic growth is closely tied to the consumption of stainless steel, which is produced using nickel. When the world economy is growing, steel consumption thrives, but when it is doing poorly, consumption of steel and therefore nickel declines alongside it. Although global nickel consumption grew by 6.7% and 3.9% in 2011 and 2012, respectively, and production rose by about 6% in both years, price declines meant that producers were left with year-end surpluses of 51,000 tonnes in 2011 and 33,000 tonnes in 2012. Analysts forecast that the demand and supply for nickel will balance out in 2013, leaving a surplus of only about 3,000 tonnes. By the end of 2014, analysts expect a deficit of 12,000 tonnes of nickel, which should put upward pressure on prices. Consumption is also expected to rise by 6.6% in both 2013 and 2014. However, there is significant variety among analysts' predictions, so we can never be too careful in utilizing these forecasts. China is responsible for 42% of gross nickel consumption globally, but it used to produce over 70% domestically, with the remaining 30% shared among the world's producers. However, in terms of per capita nickel consumption, China lags behind Japan and Europe. There is a huge opportunity to increase nickel consumption globally, and most analysts forecast a nickel deficit around 2022 to 2025.

Zooming in on Anglo American's Brazilian operations, could you provide us with an overview of the successes and challenges at both the Barro Alto and Codemin mines?

Our nickel business in Brazil includes two operating assets, Codemin and Barro Alto.

Codemin was established 30 years ago, and it remains a very stable operation, producing 9,600 tonnes of nickel in 2012. At Barro Alto, we are currently facing a challenge in ramping up to nominal capacity due to problems with the equipment suppliers for the kilns and electric furnaces. As a result, we could not achieve our production target of 41,000 tonnes, producing only 26,000 tonnes in 2012. We hope to achieve nominal capacity rates in the near future. Overall, Barro Alto Project has been a great success in terms of safety indicators, capital expenditure and implementation, with a final investment of USD \$1.96 billion. Barro Alto also has one of the lowest capital intensity rates of nickel projects globally.

Looking ahead to the future of Anglo American's nickel production in Brazil, what potential do you see at the Jacaré and Morro Sem Boné projects?

Anglo American has significant growth potential in Brazil. We completed our pre-feasibility study for Jacaré, confirming its potential to produce both ferronickel, which contains 30% nickel, and electrolytic nickel, which contains 99% nickel. Historically, the nickel business has been characterized by high margins, but the industry is also very capital-intensive. We managed to significantly reduce our total investment for Jacaré, and we hope to present the project to the Board of Anglo American in the future. We are currently working on obtaining all the necessary environmental licenses. We believe both these projects present very good opportunities to increase our nickel production, but the key factor will be how they fit with Anglo American's global strategy. At the moment, low nickel prices mean that it is not the most attractive commodity to invest in. Our focus for 2013 and 2014 is in Barro Alto. After we finish the ramp up there, we can begin to focus our efforts on new projects.

What are the unique features of the nickel that is being produced in Brazil, and why is the country lauded for having such great potential in this commodity?

Until 2003, about 90% of the nickel produced globally was from sulphides, and these deposits were predominately found in the northern hemisphere. However, as these reserves are being depleted and no significant new discoveries made, production shifted to the southern hemisphere, where laterite deposits were more common. Today, about 80% of production comes from laterites, and the future of the nickel business will be in producing nickel from laterites. Brazil holds very strong laterite reserves, which is why the country has such great potential. However, production costs are higher when mining from laterite deposits. When nickel is produced from sulphides, the nickel can be associated to copper, gold, silver or platinum, meaning that production costs are lower. When mining from laterites, nickel is produced through either ferronickel or hydrometallurgy. Producing from hydrometallurgy allows you to exploit resources with lower nickel grades. Since the deposits with higher grades are being depleted, we now need to use those lower grade resources. Most of future nickel projects will all be based on hydrometallurgical processes which already exist, but a breakthrough technology will make this method more cost competitive. Companies around the world are trying to develop a breakthrough hydro-metallurgical process, including Anglo American. •



## INTERVIEW WITH

Jeremy  
MartinCHIEF EXECUTIVE OFFICER  
HORIZONTE MINERALS

.....  
 Could you provide us with an overview of Horizonte Minerals' Araguaia project?

The Araguaia district was first discovered by Falconbridge around eight years back. We had been active with some gold projects in the Carajas region and were also looking for iron ore potential there, when we made a grass-roots discovery of the Lontra nickel project about three years ago: it was in a very promising area in between Serra do Tapa and Teck Resources' Araguaia project. We encouraged both neighbors to combine our asset with theirs, but in the end the problems inflicted on Teck Resources by the financial crisis led to Horizonte Minerals acquiring its project, rather than them buying us. We were at the right place at the right time – Teck Resources would not sell the project today. It was a fairly unique deal: they did not want to sell, but we came to an agreement whereby they took a 41% share in our company. It is one of the largest holdings they have in a junior company, so Araguaia is obviously of significant importance to them. We have a good working relationship, but the day-to-day operations are managed independently of Teck Resources.

What was Araguaia's state of development when you took it over from Teck Resources, and how has Horizonte Minerals advanced it since?

Araguaia had no defined mineral resource when we acquired it in late 2010. Since then, Horizonte Minerals has completed around 30,000m of drilling and released two resource statements, the most recent one early last year. We then finished a preliminary economic assessment last August; the next stage of work, to complete a prefeasibility study, is just commencing. The aim is to do it by Q1 next year, at the latest, and then move into a bankable feasibility study. We have conducted extensive metallurgical testing, working with

Xstrata in Canada and a local group called IAGO in Brazil; more will be done this year. In 2013 there will also be an updated resource statement in Q3 and a news-flow on our mining and environmental permitting process.

Laterite ore is difficult to extract. In this context, what type of process is Horizonte Minerals' considering?

As this is a saprolite resource, we will be using exactly the same rotary kiln electric furnace process as Anglo American is employing at Barro Alto. This is a 60 year old technology and there are around 19 operating plants worldwide using it today. Vale was using a similar process at Onca Puma, but it obviously has not been quite as successful as Barro Alto, which, although it has had a few teething troubles, was built on budget and has delivered. Nickel laterites are difficult and expensive to develop, so we want to use a proven process with contractors who have done it before. Barro Alto is a good model to follow, and the technology is a very compelling selling point to investors.

Mining regulation in Brazil varies significantly from state to state. What is it like in Para?

The code in Para is similar to how it is in many other states. The important thing about Para, however, is Carajas makes it a mining state. It is generally mining-friendly, and the majority of infrastructure developed has been related to opening up the industry. In the south, where mining is less of an economic force, mining companies will probably meet more resistance. Everyone is obviously waiting on the content of the new mining code, which I regard as fundamental to the future of Brazil's mining industry. In the current climate of lower metal prices, it is crucial governments do not start levying excessive taxes or royalties on projects that cannot service them. The DNPM is still working, and Horizonte Minerals has passed

a number of permitting milestones in the last two years. However, some of the new concessions we are waiting to have granted are under lockdown – we hope this changes as soon as possible, because it is restricting what future exploration work we can do.

What is your timeline for production at Araguaia for Horizonte Minerals and what is the mid-term vision that you have in store for the company?

We will take 12 to 18 months to complete our bankable feasible study, and there will then be another 12 to 18 month construction period. Ideally Araguaia would enter production in mid-to-late 2017. Horizonte Minerals is flexible about the project's development: it could be built by Teck Resources and us, or a third party could come in as well. There are also a number of options for the sale of our nickel. There are markets in Brazil, the US, Europe and of course China – we would aim to enter a mid-to-long term supply contract wherever we found the best deal. Brazil has two or three nickel projects being developed, and there will be a period of two of three years of oversupply as they reach capacity, but from 2016 or 2017 underlying demand will outstrip supply here. Over the last year there has been a big reduction in capital expenditure by the majors, which has hit nickel very hard – not many new projects will be developed after the current wave. There is no substitute for stainless steel, and even during the last two to three years of global stagnation the demand for nickel has grown by three to five per cent annually. We want to be one of the leading junior companies developing a project in Brazil – there are not many here. Horizonte has grown from a very small entity when it entered the country five years ago, and our eventual aim is to bring Araguaia into production. •


## Potash

Supporting Bazil's agriculture boom


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 In August 2010 The Economist published an article entitled “Brazil's agricultural miracle: How to feed the world”. In this, The Economist described Brazil's agricultural revolution: a process of embracing science not subsidies that turned the country from a net food importer to the world's first tropical agricultural giant, challenging the dominance of the traditional “big five” food exporters: America, Canada, Australia, Argentina and the European Union. In the three years since, Brazil has not disappointed. As has been widely reported in the international press, the country's agribusiness has gone from strength to strength: in addition to being the world's largest producer of soya, coffee, orange pulp and sugar cane, the country is now also the world's fourth largest grains producer. The sector directly employs some 15% of the population and accounts for over 25% of GDP. Between 2001 and 2011 Brazil's agricultural exports increased from \$16 billion to approximately \$80 billion, which constitutes an increase of over 400%. By comparison, in the same period the USA's agricultural exports increased by just 175%.

Aside from the increases in production volume, Brazil's agricultural industry has also become much more efficient. In 1970, across the 16 main arable crops grown in the country, the average yield a farmer could expect was 1.44 mt per hectare, whilst today this figure stands at five mt per hectare. This improvement in efficiency has been made possible to a great degree by increased usage of mineral fertilizers, for although Brazil is blessed with a vast amount of arable land, ample sunshine, and abundant fresh water, in many areas its soil suffers from a relatively low nutrient content. Today the country uses some 300 million mt/y of fertilizers, making it the fourth largest consumer in the world after China, the USA, and India. However, domestic production is nowhere near sufficient to meet the ever-increasing demand, and today Brazil imports more than 70% of its fertilizers. In an effort to remedy this situation, the government has set itself the ambitious goal of becoming entirely self-sufficient in fertilizers by the year 2020.

To meet this target on time Brazil will have to act fast, particularly in developing its potash production capacity, as 92% of the potash used in the country today is imported. The remaining 8% is produced by the only operational domestic potash concern; Vale's Taquari-Vassouras mine in Sergipe. However, this project is widely believed to be in the last stages of its life cycle and, to compound matters, Vale's Rio Colorado project in Argentina, which was supposed to replace production of the Sergipe mine, has been on hold since January. This development could have very serious conse-




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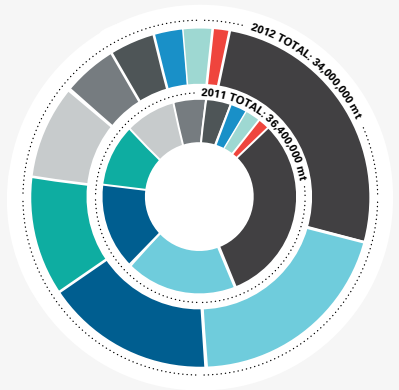


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Potash Production by Country ('000 mt)

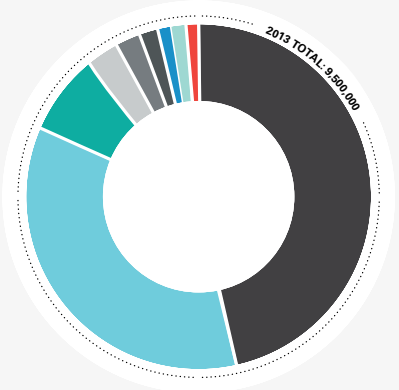
Source: USGS



COUNTRY	2011	2012
● Canada	11000	9000
● Russia	6500	6500
● Belarus	5500	5650
● China	3700	3900
● Germany	3010	3000
● Israel	1960	1900
● Jordan	1380	1400
● USA	1000	900
● Chile	980	900
● <b>Brazil</b>	<b>454</b>	<b>460</b>

Potash Reserves by Country ('000 mt)

Source: USGS



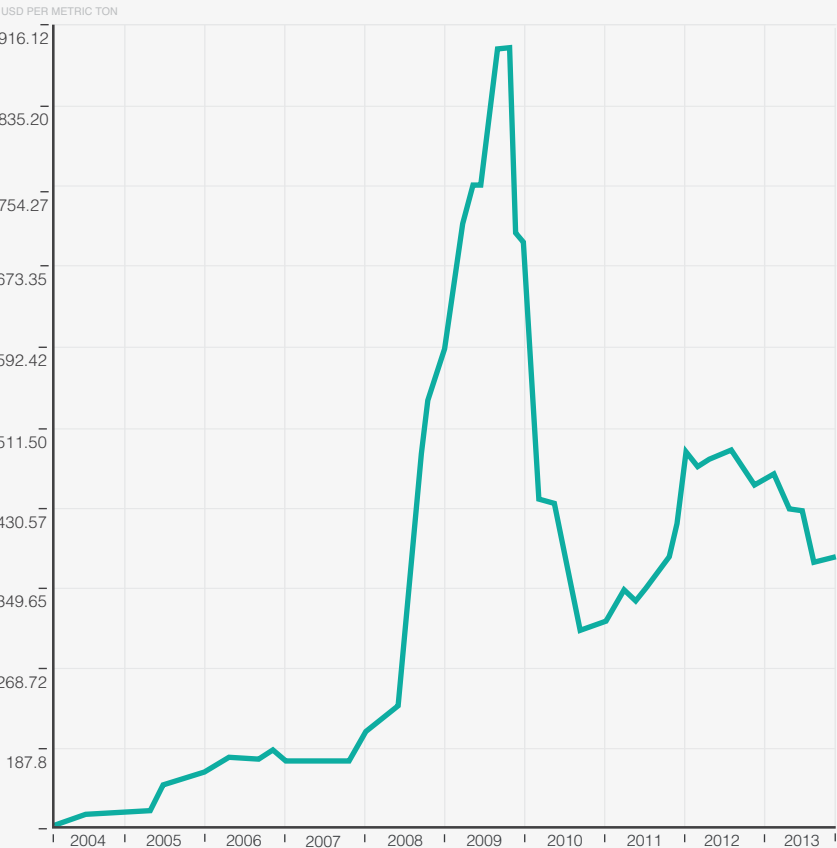
COUNTRY	RESERVES
● Canada	4 400 000
● Russia	3 300 000
● Belarus	750 000
● <b>Brazil</b>	<b>300 000</b>
● China	210 000
● Chile	150 000
● Germany	140 000
● United States	130 000
● Israel	40 000
● Jordan	40 000

quences for Brazil. “Where problems might arise is if another investor takes over the project and decides not to uphold Vale’s commitment to export 90% of output directly to Brazil, choosing instead to sell to other markets. This would disrupt the equilibrium that has been established and would have negative repercussions for the entire industry,” said David Roquetti of the Brazilian National Fertilizer Association (ANDA). Brazil’s potash deposits are fiendishly difficult to extract and process compared to the more straightforward reserves found in Russia and Canada, and many juniors struggle to develop a cost effective beneficiation process. Nevertheless, this has not acted as a deterrent to the several companies currently investing in bringing the next big potash concern to production. Indeed, according to data from IBRAM, potassium will see the second highest amount of investment out of all minerals in the 2012 to 2016 period, totaling some \$7.6 billion. One of these companies is TSX-listed Verde Potash, which is seeking to develop a \$2.3 billion potash project in Minas Gerais. The Cerrado Verde mine will eventually produce 3 million mt/y of potash for the domestic market. That being said, delays with the bankable feasibility study have slowed the project down and could push back production by up to a year. The Forbes and Manhattan group is also involved in potash through its Potassio do Brasil company. “The resource is located in a basin that could theoretically provide for all of Brazil’s potash needs. We have a resource of half a billion tons and are currently raising funds to carry out a final feasibility study,” said Hélio Deniz, VP Brazil Operations at Forbes and Manhattan. If all goes well, then it is eminently possible that these projects will be able to fill the gap left when Taquari-Vassouras is eventually decommissioned, but it remains to be seen whether or not they will manage to deliver sufficient quantities to totally eliminate the reliance on imports. The odds of Brazil reaching its self-sufficiency targets in phosphates are rather more favorable; the country already produces 50% of its total consumption and there are a number of

on-going developments that should see this percentage rise even further. One of the most important new players in this field is B&A Mineração, a new venture set up by Vale’s former CEO, Roger Agnelli, which will be investing approximately \$550 million over the next two to three years on developing projects in fertilizer minerals, iron ore and copper. “Since our foundation in August 2012, we have been consolidating our portfolio and looking outside for new potential. Looking specifically at phosphates and potash, we are currently finalizing our acquisition of Rio Verde Minerals and are pushing to establish a new phosphates target in the northeast as growth in this region is set to increase national demand for fertilizers by some 5% to 6%,” said Eduardo Ledsham, CEO, B&A Mineração. B&A also owns a 12% stake in MBAC, an integrated fertilizer producer that was established in Brazil in 2008 by several former directors from Yamana Gold. “The philosophy behind MBAC is to grow strong on agricultural fundamentals, and Brazil’s agribusiness is booming today. Our two most advanced projects are based in the country’s new agricultural heartland around the states of Maranhão, Tocantins, Piauí, and Bahia, where demand for fertilizers has seen double-digit growth for the last few years,” said Carlos Braga, VP Technical Services, MBAC. By 2016, both these phosphate projects should be operating at full capacity and delivering a total of 1 million mt/y of SSP to fertilizer blenders in the agricultural states of Brazil’s savannah region. Whilst the new players are concentrating on developing greenfield projects, Anglo American is currently in the pre-feasibility stage of an expansion of their existing Ouvidor phosphate mine in Goiás. “We hope to see this study completed by the end of 2013, a final feasibility study finished by 2014, and we will be ready to submit to the board for final approval by 2015. The eventual aim is to double total production from 1.4 million mt/y to 2.8 million mt/y,” said Ruben Fernandes, CEO, Anglo American Phosphates and Niobium. •

Potassium Chloride Prices

Source: World Bank

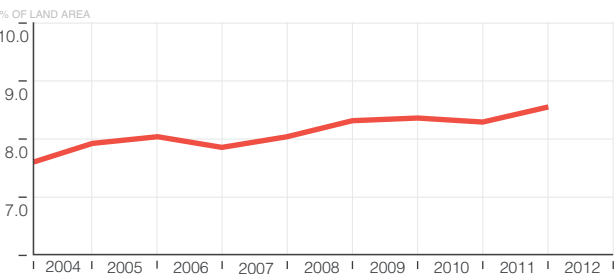


“The agricultural industry in Brazil is growing three times more than the average for the Brazilian economy, which is in turn growing at twice the rate of the rest of the world’s economy. Brazil currently consumes some 30 million mt of mineral fertilizer per year. This makes it the fourth largest consumer worldwide after China, India and the USA, although it only accounts for 6% of world consumption. Over the past 22 years the Brazilian market has grown at 5.8%, twice the world average... Organics are a valuable and growing sector in Brazil but with an estimated market value of \$1 billion to \$2 billion, they are currently very small in comparison to NPK fertilizers, which stand at \$23 billion. Overall we import 70% of all fertilizers consumed; broken down by substance, 65% of nitrogen and 92% of potassium is imported with phosphorous being the only material of which we produce more than we import.”

- David Roquetti, CEO, Associação Nacional para a Difusão de Adubos (ANDA)

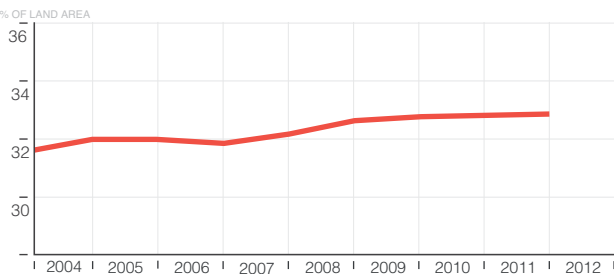
Arable Land

Source: World Bank



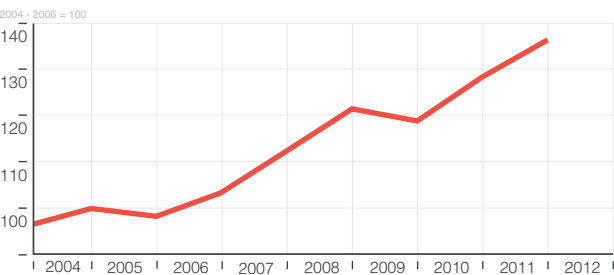
Agricultural Land

Source: World Bank



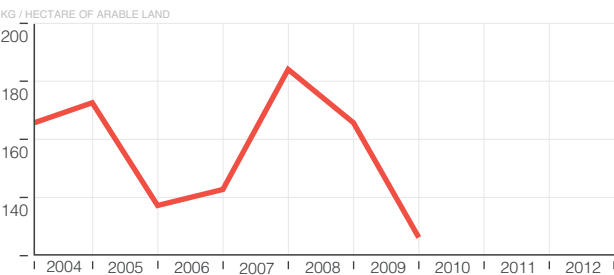
Crop Production Index

Source: World Bank



Fertilizer Consumption

Source: World Bank







INTERVIEW WITH

# Eduardo Ledsham

CHIEF EXECUTIVE OFFICER  
B&A MINERAÇÃO

Can you provide us with an overview of the projects B&A Mineração currently has on the books?

Since our foundation in August 2012 we have been consolidating our portfolio and looking outside for new potential. Looking specifically at phosphates and potash, we are currently finalizing our acquisition of Rio Verde Minerals and are pushing to establish a new phosphates target in the northeast as growth in this region is set to increase national demand for fertilizers by some 5% to 6%. We inherited the Bonito project from Rio Verde and it is currently in the implementation stage and should be operational by December 2013. This is a high quality SSP project that will be producing 150 kt/y for the agricultural powerhouses of Pará, Tocantins and Maranhão, and we are hoping to double the mine life from 10 to 20 years. As for copper, we have an interesting acquisition in Chile that will soon begin producing 15kt/y, but the idea is to develop small pit clusters around the principal mine site and therefore significantly increase output. In addition to this, we are starting a program in Northern Chile to produce concentrated copper. With regards to iron ore, we are going through a due diligence process for several projects in the northeast and southeast of Brazil and are at an advanced stage of discussion for several acquisitions in Africa, particularly around the Copper Belt.

What is your current investment budget for new projects?

B&A started with a budget of approximately \$550 million that we will invest over the next two to three years. Of this, \$185 million has gone into acquiring Rio Verde and our 12% stake in MBAC Fertilizer Corp. For now the focus is on consolidating our portfolio, and after that we may go to the markets for a second round of funding. There will be many op-

portunities to bring in other players or look into private equity funding. The issue today is not sourcing funds, but rather finding quality projects and guaranteeing value to our shareholders. In order to achieve this, we have assembled an exceptionally highly skilled team, with detailed knowledge that covers all aspects of mining from exploration to metallurgy, as well as some of the best business brains in the country. This reflects the partnership between BTG Pactual and AGN which sees the most experienced operatives in project finance and some of the most knowledgeable players in mining working together to deliver results.

How does B&A deal with Brazil's notorious shortage of skilled labor in Brazil, a trend that has been identified by many of our interviewees, such as Paulo Castellari at Anglo American Iron Ore?

Sourcing skilled labor is certainly still a factor that must be taken into account whenever we are planning a new project, but this said, we have seen the quality of Brazil's labor force improve dramatically in recent years thanks to improvements in education, and initiatives by private companies. In the northeast for example, there is a training program run by a consortium of companies in the region called CESI, which delivers training and capacitation in specialized engineering. Today, the main problem with the workforce is not the lack of capable operatives, but the high costs associated with maintaining employees, and this can be a challenge to a company's competitiveness.

What is B&A's take on the new Mining Code and how do you believe this will affect the industry?

Although many companies in the sector are fearful of the consequences of the new legislation, one positive aspect at least is that now

the rules of the game will be much clearer for everyone involved. We feel that the new code, whilst not perfect, will go a long way towards establishing more stable conditions to attract investment. Brazil has so much potential, but it is of vital importance that these new laws are implemented well in order to bring more funds into the country. Some issues that need to be addressed, such as environmental licensing and infrastructure problems are notably lacking in the draft form of the bill, but we are confident that these areas will be cleared up as the law passes through Congress.

Dealing with communities has proved to be a serious stumbling block for many major mining companies in Brazil. How does B&A manage its relations with local communities?

We believe that it is vital to work together with communities from the very first stages of project development; it is important to invest in the local area, and to take a serious look at how our project can benefit the area. For example at the Bonito site, we will give a proportion of the fertilizers produced at the mine to local farmers. Aside from mining, B&A also has interests in the energy sector. Bioelectricity produced from sugarcane is another area in which we are able to work in conjunction with communities, by offering something to them that is incredibly beneficial. For example, we can construct a plant that will provide the mine with all of the energy that it needs, and also serves to supply clean energy to the local people. Offering these extra services to the community not only benefits the local area, but also helps the authorities to see the positive effect that we can have on the country, which in turn makes it easier for us to acquire the necessary licenses. •



INTERVIEW WITH

# Ruben Fernandes

CHIEF EXECUTIVE OFFICER  
ANGLO AMERICAN PHOSPHATES AND NIOBIUM

Could you explain the reasoning behind the grouping of phosphates and niobium under one roof, and then give us an update on how the unit fared in 2012?

The reason for the seemingly strange grouping of phosphates and niobium is simply that our projects for both materials are geographically very close together, and we are also able to extract a small amount of niobium from a tailings dam at our phosphate beneficiation plant. As such, even though the markets for both minerals are completely different, they fit together well from a business perspective. As a division we have very sustainable results, thanks in large part to the fact that both the phosphates and niobium markets are much less volatile than the base or precious metals; phosphates are linked to fertilizers, which are a guaranteed growth market here, and niobium is still a niche material whose buyers are mostly concentrated here and in Canada. In 2012 we performed well, managing to stick to our budget despite the adverse economic conditions that prevailed in Brazil, and this was the case in 2011 as well.

Can you provide some details about your phosphate mine and processing facilities in Brazil?

We have one phosphate mine, which is located in the region of Ovidor, in the state of Goiás. It is a strong reserve that has been in operation for some 20 years, and it has a projected lifespan of another 40 to come. It also boasts one of the highest grades in Brazil, with an average of 11% to 12% P2O5. This mine feeds two separate fertilizer production plants: the first is nearby at Catalão, which is connected to the mine by mineral pipeline, and the second is in São Paulo state, which receives most of its raw material via railway and truck. The reason for this dual production strategy is in order to supply the two principal agricultural regions

of Brazil: our plant in Goiás is located on the frontier of the new agricultural powerhouses of the MaToPiBa states, and everything produced in São Paulo is sold in the historically important southeastern states. All our fertilizer is sold to blenders who then mix a variety of NPK products and sell them on to distributors and agricultural producers.

Given that fertilizer minerals are such a strategic market at the moment are you looking to acquire any new projects or branch out into potash as well?

At the moment we are not interested in acquiring new projects. Instead, we are concentrating on expanding our existing phosphates mine, and are currently at the pre-feasibility stage of this enlargement. The process must be based on a solid foundation and follow the international protocol set down by Anglo American, so we hope to see this study completed by the end of 2013, a final feasibility study finished by 2014, and we will be ready to submit to the board for final approval by 2015. The eventual aim is to double total production from 1.4mt/y to 2.8mt/y, although we are still working on the details of how exactly this will be accomplished and what the final product will be. As for potash, whilst it is a good mineral to be involved in and the potential in Brazil is enormous, we are more focused on developing brownfield projects that have already demonstrated proven value.

Last year saw a 56% rise in profits for Anglo's niobium business. Can you provide us with an overview of the current niobium facilities in the country, and shed some light on how you accomplished such a dramatic rise?

Anglo American has two facilities for niobium extraction in Brazil: the main one is our open-pit Boa Vista mine, which is also located in Goiás, but is completely independent of

the phosphates production, and the second is the tailings dam at our beneficiation plant for the phosphates operation. The output from both of these sources is then integrated at our processing plant in Ovidor to produce ferroniobium. We are currently expanding Boa Vista, both in terms of the mine itself and the capacity of the beneficiation plant. Today, we only process oxide ore, but with the new expansion we will be able to start upgrading fresh rock too, which will increase our total production by some 50%. The 56% rise in profits we saw last year was primarily achieved through cutting costs, improving efficiency, and increasing productivity, particularly in the area of upgrading our recovery techniques. By focusing on marginal gains at the very top of the mining chain in this way, we were left with the concrete result of more ferroniobium at the end of the chain.

In the context of the recently released new Mining Code, what is your vision for the future of the company here in Brazil?

It is hard to gauge exactly what the effect of the new code will be on Brazil's mining sector, but it is important that a new level of certainty and clarity has come to the market and we believe that this will foster much better conditions for doing business throughout the industry. With regards to Anglo American, we consider ourselves to be very well positioned in terms of our portfolio: both our niobium and phosphate concerns are generating positive results for the company and we have solid plans for the expansion of both areas. Looking to the future, Brazil is an important factor in Anglo American's global operations, and we hope to become more engaged with the country across all the areas in which we are involved. We will invest more in the country and I strongly believe that we have the potential to truly make a difference to Brazil with our investment. •



INTERVIEW WITH

# Eran Friedlander

PRESIDENT & CEO  
EAGLE STAR MINERALS

Could you provide us with a brief overview of Eagle Star Minerals' history and main milestones?

Eagle Star Minerals has been in operation in Brazil for almost three years, and our initial focus in the country was iron ore. However, as we progressed with building up our team and exploring opportunities, we realized that the most attractive market for us was in fact fertilizers. There is a big gap between supply and demand for fertilizers in Brazil and given how the country has the biggest arable land package in the world, it became obvious to Eagle Star Minerals that that was the path it needed to pursue. We moved quickly to get the right people on board and seize the appropriate opportunities and overall, we have been very successful over these past three years, despite the general market reluctance towards juniors. Eagle Star Minerals has succeeded to make significant progress and raise its share prices, our investors are happy and we are optimistic about the future. Due to the nature and the location of our assets, which are situated in the region of Cerrado, we are looking to go into production as early as next year.

What can you tell us about the infrastructure in the region and what is Eagle Star Minerals' budget for the year 2013?

Eagle Star Minerals benefits from all the investments that have already been made in the region to accommodate MBAC's business. The local government has been building roads, an airport, power lines and water dams which are all continuously being improved. In terms of our budget, most of it will go into continuing the drilling that is going on at our Bomfim Hill project, where we currently have one rig, but will probably be adding one or two more by the end of the year, as new targets are being discovered and developed. Eagle Star Minerals is also looking into building up its facility for the direct application natural fertilizer and

as of yet, we do not know exactly whether we will be acquiring an existing facility or if we will be building our own. In addition to our Bomfim Hill project, we are also conducting live environment tests for our direct application fertilizer product at our Ruth project, in Piauí. Overall, our budget for the year should amount to almost \$ 5 million.

Eagle Star Minerals currently has three projects in Brazil: Bomfim, Ruth and Samba. What is their state of development and what is your main focus for the year?

Eagle Star Minerals' main focus for the year is Bomfim, with which we will be going into production (open-pit) in a very short period of time, given the low costs associated with it and the already existent demand for natural fertilizer in the region. The clients are there, the infrastructure is there and the quality of the phosphate has already been proven through MbAC's successful operations in the area. There is enough high-grade material there to last for at least five years of production and we are also currently in the process of releasing a preliminary NI 43-101 resource estimate report for a small portion of our Bomfim Hill target; the report is expected to come out in June. Ruth, which is situated in Piauí, is another project that holds great potential and we are in the process of conducting live environment tests for one of the products that we intend to sell; if these prove to be successful, we will consider going into production in the near future at that site as well. Samba has had some very good preliminary results but due to the strike that has been going on at the DNPM last year, we are still in the initial stages of the exploration process.

What are the grades of phosphate that you are intersecting?

Bomfim Hill has grades that range from 2% (in large volumes) to 28%, which constitutes

a very high grade, especially for Brazil, where anything above 10% is already considered to be a very good grade. The quality of the phosphate matters a lot in terms of the price we can obtain for it and it also lowers the processing costs, so overall, it constitutes an important advantage for us. Eagle Star Minerals is in a very good position, since it is quite hard to find good grade phosphate in Brazil.

Eagle Star Minerals has significantly increased its market capitalization to \$ 22 million in 2013, a notable performance in the current rough market conditions for juniors. How did you achieve that?

Eagle Star Minerals is focused on a very good commodity, and many believe phosphate is going to become increasingly popular in the future, given the world's growing population and its need for food. Furthermore, Brazil itself is the largest agrarian country in the world and its huge demand for our commodity has drawn a lot of attention to us. Over the past months, Eagle Star Minerals really began unveiling its potential and all the factors point out to a very strong opportunity for us here. Additionally, the government's policy to reduce agro-mineral royalties to 2% in order to incentivize phosphate and potash exploration has also helped us.

What is the future of the phosphate sector?

Phosphates are on the rise and the recent M&A activity in the sector stands as proof to the fact that investors are turning their eyes to the sector more and more. As the planet's population is rising, so will demand for phosphates; most of the phosphate resources are located in the Middle East and given the delicate geopolitical situation in that area, finding new deposits in countries like Brazil will be key in assuring a good business, as this will greatly reduce transportation costs to where the resource is needed most. •

INTERVIEW WITH

# Carlos Braga

VICE PRESIDENT TECHNICAL SERVICES  
MBAC FERTILIZER

Can you give us a rundown of MBAC's principal projects today?

Today MBAC has three main projects on its books, the most important of which is our Itafós SSP project in Tocantins. We acquired the rights to the deposit in late 2008, and now after four and a half years of development and \$320 million dollars of investment we are just going into production. The whole complex consists of a mine, a beneficiation plant, a sulfuric acid plant, and a fertilizer production plant. As it stands, we are nearly fully operational, and are just waiting to commission our fertilizer plant, however, by the time this report comes out we should be operating comfortably and running at our full capacity of 500 thousand tons per year. Our second project, Santana, is another phosphate mine and fertilizer plant located in Pará. MBAC acquired the deposit in 2011, and we are currently at the final stages of the feasibility study, which should be published by September 2013. The estimated life for this deposit is 30 years, and it could be the highest grade phosphate mine ever seen in Brazil, with an average grade of nearly 13% P2O5.

Our third major project is a very interesting rare earths deposit in Araxá, Minas Gerais. This too was acquired in 2011 as we were looking for another phosphate mine, but whilst going through the due diligence process we found that above the phosphate there is a layer of high grade REEs. This is very exciting as we are one of the few companies in Brazil with the necessary technology to process these elements. We already have a pilot plant in production that is delivering concentrated oxides with grades of up to 99%, and the second stage of this plant will be to concerned with the separation of the different oxides. This should take place towards the end of 2013. Although we are still at a fairly early stage in this project, our first indications suggest that the eventual opex to bringing these minerals to production will be low enough to compete with Chinese producers.

How have you found the process of acquiring the various permits and licenses necessary to develop a project in Brazil?

It is always a challenge to get all the necessary documentation to develop large-scale industrial projects in Brazil, but we have had different experiences in the different states that we operate in. In Tocantins, Itafós was in fact the first big mining project to be developed in the state. This made it rather difficult for the local environmental agency, as they were not accustomed to dealing with the type of processes and paperwork that we required. In Minas Gerais, on the other hand, the authorities have many years of experience with this type of project and the local population is well aware of the benefits that mining brings to the area. Araxá itself is a very well developed jurisdiction to work in, with several mines and two engineering schools already established in the vicinity. Pará state is different again; here the main challenge is the sheer number of mining projects in development, which has overwhelmed the local agencies and created long waiting lists. That being said, the government has always been very supportive of our work, and they were always ready to help us with any difficulties we had. One strategy that MBAC has found to be immensely helpful is to hire local consulting firms who have a detailed understanding of the area and of the local regulations. We believe that this can speed up a project timeline by several months or even a year.

Two issues that are frequently cited as being the most challenging obstacles to overcome in developing a mining project are the shortage of skilled labor, and fostering good relations with local communities. How does MBAC approach these concerns?

Finding skilled labor is certainly a concern for us. In Tocantins we have tried to maintain a good balance between local workers, who we have been training in-house, and more ex-

perienced labor that we are bringing in from outside. At the Santana project, this is unfortunately not an option as the nearest town is over 150km away, meaning that we have to deal with the logistics of bringing the whole team in from other regions. As for community relations, it is of paramount importance to establish a climate of trust from the outset. We have found that if you are transparent and honest in your dealings with the local people and make clear all the risks and advantages that the project will bring, then generally the vast majority of people are content.

What kind of impact do you believe the New Mining Code will have on MBAC's operations and overall profitability?

We are somewhat concerned about the impact that the New Regulatory Framework will have on MBAC. Although the code has been released to Congress, it is still unclear what the effects will be on phosphates; the royalty rates are still not certain, and neither is the methodology for calculating the tax base. We hope that the final regulations will be well thought out and will complete their supposed goal of making the national mining sector more competitive. As it stands, we are subject to more taxation for selling our phosphates over the state line from Tocantins to Bahia, than a foreign company is for bringing fertilizer into the country from China or Egypt.

How do you see MBAC developing over the next five years?

Five years from now we hope to be a very profitable integrated producer of fertilizers with our Itafós and Santana projects producing at full capacity. Brazil's agricultural production is forecasted to see continued growth, particularly in the MaToPiBa and Pará/Mato Grosso states where we are located. In the long run, we may even be able to double capacity at both these mines if and when the market demands it. •

# Gold

Not as shiny as it once was

Brazil has a long gold mining history: the late 17th century saw the first gold rush in Brazilian history that attracted almost a million Portuguese and their African slaves to the region. Today, gold is Brazil's second most exported mineral after iron, and in 2012, the South-American country was responsible for \$2.4 billion worth of gold sales. Brazil, which is the 12th largest global gold producer, also holds the 9th position in terms of worldwide reserves. However, the last 18 months have seen the price of gold plummet to a recent record low of less than \$1,200 per ounce in June 2013. This depreciation has led to producers and juniors experiencing difficulties lately, hardships that were also augmented by the uncertainties regarding the new Brazilian mining code and its impact on the industry.

While the Brazilian gold mining environment is dominated by Canadian companies, major South African player AngloGold Ashanti leads the way with two operations in Brazil. The first is the Córrego do Sítio Mineração project in Minas Gerais, a project that has a total of five mines and three plants, one of which was acquired from ElDorado in late 2008, refurbished and brought into operation in January 2012. The second asset, located in the state of Goiás, is called Serra Grande and AngloGold Ashanti obtained 100% ownership of the site in late May 2012, after acquiring Kinross Gold's 50% stake in the project for \$220 million. Employing a total of 5,300 people at these sites, AngloGold Ashanti produced a total of 486,000 oz of gold in Brazil in 2012.

TSX and NASDAQ listed Kinross Gold leads the wave of Canadians producing gold in Brazil and the company's landmark project in the country is Paracatu, an asset with proven and probable reserves of 17.9 million oz at 0.40 g/mt Au, which is located in the state of Minas Gerais. Kinross Gold achieved 100% ownership of the open-pit project in 2004, and in

2012, the company produced 466,709 oz of gold in Paracatu, an asset that saw its mine life being extended to 2042 in recent times.

The series of TSX listed gold producers in Brazil continues with Yamana Gold, a company that owns and operates three projects in Brazil: Chapada (18 year mine-life with 3.37 million oz at 0.27 g/mt Au proven and probable), Fazenda Brasileiro (five year mine-life with 306,000 oz at 2.30 g/mt Au proven and probable), and Jacobina (13 year mine-life with 2.4 million oz at 3.02 g/mt Au proven and probable). Located in Goiás and Bahia, these assets accounted for a total of 311,000 oz of gold produced during 2012. Yamana Gold, which also has assets in Mexico, Argentina, Chile, is currently developing three other projects in Brazil, with its underground Pilar Project (Goiás) being expected to complete commissioning in 2013.

Yet another TSX-listed company, Jaguar Mining, maintains its status as an important gold producer in Brazil with its Turmalina, Paciencia, and Caete projects, all located in the state of Minas Gerais, accounting for a total of 102,823 oz of gold in 2012. Turmalina has measured and indicated resources of 1,172,080 oz of gold at 4.22 g/mt of Au and had a production of 37,840 oz in 2012. Paciencia, which boasts 920,770 oz of gold measured and indicated at 3.76 g/mt Au, accounted for 9,987 oz last year. Finally, Caete, which encompasses 1,930,490 oz of gold at 3.31 g/mt Au, had a total output of 54,996 oz in 2012.

Finally, Eldorado Gold, which has operations and projects in development scattered across the four continents, is focusing its Brazilian efforts on the Tocantinzinho asset, located in the state of Para, which has proven and probable reserves of 1.975 million oz at 1.25 g/mt Au. The company plans to produce 159,000 oz per year at the site at a total cost of \$ 559 / mt. Tocantinzinho received a preliminary en-

vironmental license in September 2012 and is expected to come into production in 2016.

Gold juniors were particularly hit by the unfavorable gold prices and a climate of global investment slowdown. These trends have pushed juniors to put projects on hold or to develop subsistence low-scale productions meant to generate cash flow for the further development of their main gold targets (in the case of companies such as Rio Novo).

Amarillo Gold Corporation, a TSX-listed junior, has four gold projects in Brazil, but its current focus is on its Mara Rosa deposit, located in the state of Goiás, which has measured and indicated resources of 1,174,900 oz of gold at 1.75g/mt Au. Currently preparing for a bankable feasibility study, Amarillo Gold hopes to see its Mara Rosa project producing in late 2014. Meanwhile, TSX-listed junior Colossus Minerals stands out in the landscape as the only company that has engaged in a partnership with a garimpero cooperative. Colossus Minerals' Serra Pelada project is located in the Tapajos area, a region in the state of Para that saw 80,000 garimperos invading it to produce roughly 2 million ounces of gold in the 1980s. Approximately 40,000 m of drilling was done in 200 holes at the site by Vale, Serra Pelada's previous owner, and the Colossus Coomigasp joint venture added another 11,000 m in 40 holes to that already since they acquired the asset in 2007. Serra Pelada is 87% ready and gold production is scheduled to start in the late fourth quarter of 2013.

Despite the harsh global environment, the year 2012 saw a gold demand that was 15% higher than the average for the previous five years, largely led by central bank purchases of emerging countries. Meanwhile, the supply of gold contracted 1.4% in 2012 and China's imports of the precious metal reached a record level during the year. Looking forward, these developments, combined with an unstable global environment that will continue to create currency volatilities, could lead to a healthy gold price comeback. "As demand is being driven by the macroeconomic factors, with countries competing against one another to devalue their currencies, gold will be more and more in demand. Supply has been diminishing over the past years, mostly due to low grade production that is technically challenging, with projects not reaching their objectives. This is a very favorable context for gold price appreciation, and \$2000 gold should be achievable in the next 12 to 18 months," said Claudio Mancuso, CEO, Colossus Minerals. •

## Gold Reserves by Country (mt)

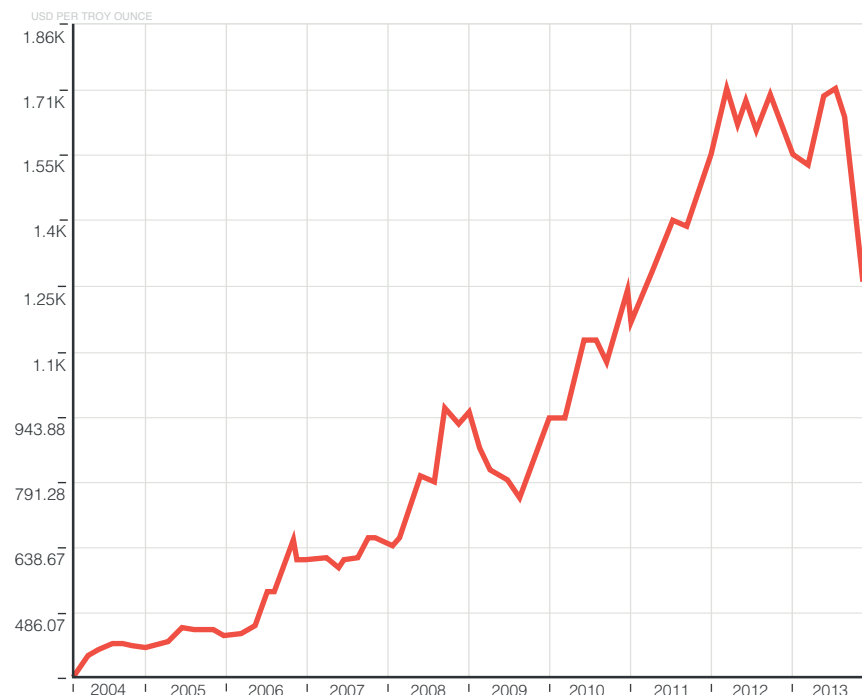
Source: USGS



COUNTRY	RESERVES
Australia	7 400
South Africa	6 000
Russia	5 000
Chile	3 900
USA	3 000
Indonesia	3 000
Brazil	2 600
Peru	2 200
China	1 900
Uzbekistan	1 700

## Gold Prices

Source: World Bank



## Brazil's Gold in a Global Context

Source: PNM, IBRAM

Global Production	2.3%
Position in Ranking	12th
Brazilian Reserves	3.3%
Position in Ranking	9th

## Investments in Gold to 2016

Source: IBRAM

	2011- 2015	2012- 2016
New Investments in the Mining Sector	2 418	1 725

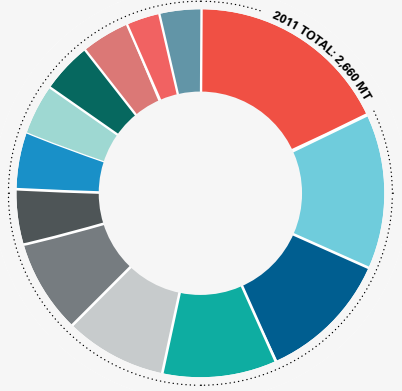
## Expected Gold Production Growth to 2016

Source: IBRAM

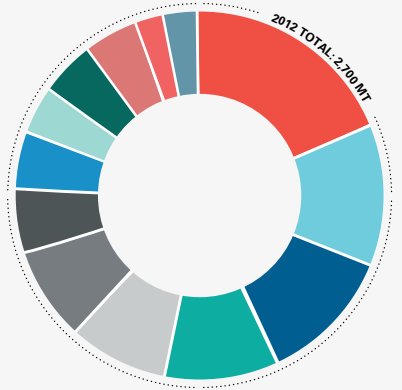
	2011	2012
Production in 2011	0.066	0.066
Increments by 2016	0.029	0.029
Expected Production by 2016	0.095	0.095
Change	44%	44%

## Gold Production by Country

Source: USGS



COUNTRY	2011	2012
China	362	370
Australia	258	250
USA	234	230
Russia	200	205
South Africa	181	170
Peru	164	165
Canada	97	102
Indonesia	96	95
Uzbekistan	91	90
Ghana	80	89
Mexico	84	87
Papua New Guinea	66	60
Brazil	62	56



## Gold Exports

Source: Aliceweb

	2010	2011	2012
Gold Exports	1,786	2,239	2,341



## INTERVIEW WITH

# Claudio Mancuso

DIRECTOR AND CEO  
COLOSSUS MINERALS

2013 marks a landmark achievement for Serra Pelada, as Colossus Minerals expects to go into production during the course the year. What is the current status of development of the project?

On the surface, we are at 80% complete in our construction of the processing plant; the biggest part of all the work is constituted by the sub-grade concrete that forms the base for all surface structures and in that regard, we are at almost 100% completion. Once civil construction is finished, we move to structural and mechanical erection, of which we have 35% complete, and the schedule becomes a lot more predictable. The process plant is on schedule to commence commissioning in August. In addition to the process plant infrastructure, we are building a power house that will have four Caterpillar generators, with only two running at a time. The first generator is installed, the second is on its way and by the end of May we should have all of them in place. These will work as back-up options and to supply energy to vital components of the plant; the rest will be assured by connecting to the national grid (supplied by Equatorial Energia), which is a lower-cost alternative for us. The infrastructure in the region is very good since Vale's Carajas mine is located there: we have support for mining activities, laboratories and equipment suppliers; we are lucky to be working in a very mature area for mining.

Seeing how Brazil is traditionally an open-pit mining country, how did you manage to get the proper equipment and the right people with the right underground mining experience to work for Colossus Minerals?

Colossus Minerals looked at a number of mines in the world that had similar conditions to Serra Pelada and we hired around 12 ex-pats that have good experience in soft rock conditions in order to train the majority

of our workforce, which is acquired locally, from the Serra Pelada village, which has a population of around 7000. Colossus has 500 employees of its own and 75% of them are locals and in addition to that, we have another 500 people contracted to do the construction work. We have been providing training in various mining disciplines such as equipment operations and mechanics for the community for two years now; not only that, but we are also providing courses, at the Colossus funded Community Development Centre in the village of Serra Pelada, that are not mining related, such as computer and business classes, in order to educate the community for their own benefit. The rest of our employees are from places like Parauapebas or Curionopolis, while 2% are expatriates. When it comes to the equipment, Colossus has made efforts to acquire everything locally, as that cut costs dramatically and we did not need to source much from outside Brazil.

Colossus Minerals has recently exercised its option for Vale's area B. What is the significance of this decision and what is the quality of the gold grade that you are intercepting in Serra Pelada?

Colossus Minerals is intercepting very high grade gold at Serra Pelada and some of our assays have returned multi kilogram per ton intercepts. However, with this kind of grade, there is a lot more work to be done to accurately estimate the resource, because there is considerable variability to take into account. We are performing underground drilling in in higher densities than can be accomplished from surface and we should be able to complete bulk sampling by the end of the second quarter and process that bulk sample through our own process plant in the third quarter; after that, Colossus will be consolidating everything into a NI 43-101 resource statement. Opting for area B has given us more land to

trace the mineralization down to the southwest. We cannot prove it yet, but based on geochemical and drilling results that we have had so far, we are very confident that the mineralization continues in that area as well.

The year 2012 has seen a 15% increase in the demand for gold while the supply for it contracted by 1.5%, while prices for platinum and palladium have also seen an increase. What do you believe the trends will be for the upcoming year?

As demand is being driven by the macroeconomic factors, with countries competing against one another to devalue their currencies, gold will be more and more in demand. Supply has been diminishing over the past years, mostly due to low grade production that is technically challenging, with projects not reaching their objectives. This is a very favorable context for gold price appreciation, and \$2000 gold should be achievable in the next 12 to 18 months. In the case of platinum and palladium, their demand and supply gives them characteristics that are closer to industrial metals. As China and India see more urbanization and increasing vehicle acquisition, we expect these commodities to perform better and better as well. Serra Pelada is expected to earn 80% its revenues from gold, while the rest will be accounted for by platinum and palladium. •

This interview was conducted on the 26th of April and therefore may not represent recent developments

## INTERVIEW WITH

# Helio Diniz

VICE PRESIDENT BRAZIL OPERATIONS  
FORBES AND MANHATTAN

Can you give us some information about Forbes and Manhattan's business model and then tell us about the Belo Sun Project?

In Brazil we run on a similar model to the one we use in Canada. The company manages several mining and exploration companies that are run independently of each other, but share support services in terms of administrative, accounting and specific engineering and technical resources. Some of our companies are publicly listed, whilst others remain private. Forbes and Manhattan usually has a significant stake in the ownership of the Company. Belo Sun is the company with the most advanced project we have in Brazil today. It is a TSX listed company that is working toward development of an open pit gold mine in Para State. The project is managed by Carlos Costa, formerly of Vale. Since 2010 we have invested approximately \$90 million in exploration and we are currently finalizing our feasibility study and working to gain the necessary environmental licenses in 2014 in order to move into construction in 2015. The total Capital investment is estimated at \$800 million and if all goes well we should be producing by 2016. The latest studies suggest that we have a five million oz resource with a grade of 1.7g/mt. Prefeasibility studies indicate production could be approximately 320,000 oz/y.

Could you give us some details on the Agua Resources Company?

Agua Resources currently owns two phosphate prospects: one in Rio Grande do Sul, and the other in Paraiba in the NE region. Both projects are at a much earlier stage of development than the Belo Sun project. The project in the south is very well located to serve the agricultural producers that are concentrated in this region, most of whom rely on phosphate that is imported from Morocco. The region has very well developed infrastructure and the

project benefits from being located very close to both a railway and a port. Today we are working on resource delineation and a PEA. Once these are finished we will move into feasibility stage. The grade we are intercepting is around 4% P<sub>2</sub>O<sub>5</sub> so the rock will then be concentrated up to 34% and then processed with sulfuric acid to produce SSP. At the prospect in Paraiba we have just completed preliminary drilling and have ascertained that we have a good resource, but we must now carry out a good deal more exploration work to take the project forward.

Brazil is facing something of a domestic potash supply crisis. In this light could you tell us about Brazil Potash Corp?

Brazil Potash is a private company and so it has not been affected by the volatile market conditions we have been experiencing. To date we have spent \$80 million on exploration and we have eight rigs working at the site today. The resource is located in a basin that could theoretically provide for all of Brazil's potash needs. We have a resource of more than 600 million mt which we continue to expand and are currently raising funds to carry out a final feasibility study. Demand for potash in Brazil is increasing rapidly on the back of the booming agribusiness, and in my view it is now more valuable than gold, because without potash the country is unable to provide food to feed its people and its agri-export businesses. Work started on the site in 2009 with a geological concept, then the following two years were spent proving this concept. We embarked on a fund raising effort in 2012 and raised \$60 million, which was then been invested in defining the mineral resource. It is a shallow deposit with a reasonable capital expenditure and low operating expenditure so the plan now is to gain the environmental licenses we need to put one area into production. The po-

tential for this project is truly immense: to put things into perspective, we are dealing with a very similar geological environment to the main Canadian potash deposits, but in that basin there are 18 producing mines, whilst here in Brazil there are none.

What do you find are the main advantages and disadvantages to working in Brazil's developing north?

The biggest challenge we face in working in the north is finding good supplies of skilled labor. There are very few trained technicians and engineers in the region, and at the same time state authorities are understandably very protective of their people so we cannot simply bring in huge amounts of workers from the south. This has forced us to spend a considerable amount in training programs. However, we are willing to invest in our personnel because they are the backbone of the company, and as long as we have the right people then we are able to continue moving forward and prospering. In terms of the advantages, aside from the fantastic geology, the region is supported by initiatives from BNDES and the World Bank, which translates into significant advantages to companies developing projects in the area. There are also regional tax breaks for private companies who choose to operate in such regions: for example, in Amazonas we pay 75% less income tax than we would do in the southern states. •

# Diamonds

An unexpected sparkle

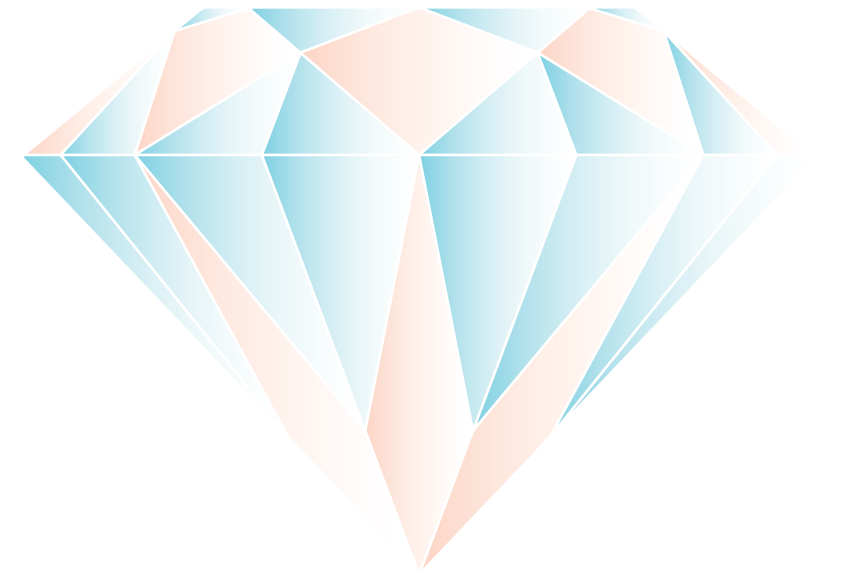
Many will be surprised to learn that Brazil is one of the leading producers of diamond in the Americas, ranking (along with Guyana) just beneath Canada. The country is, in fact, one of South America's leading producers and exporters of a range of gemstones: diamonds, emeralds, aquamarine, topaz, and so on. This does not, of course, say a great deal. Six countries account for over 77% of the world's diamond production and not one of them is located in the Americas. In short, while ranking among the top three diamond producers across two of the world's most geological wealthy continents may sound impressive, in reality it means very little.

Nonetheless, Brazil's diamond industry is not without its highlights. The country has a long history of diamond mining that started with the royal monopoly imposed by the Portuguese Crown in 1725. This monopoly lasted until roughly 1860 and during this timeframe Brazil accounted for 50,000 to 250,000 carats of rough diamond output per year, including a 254-carat stone discovered in 1854, named the "Star of the South". Mining was largely carried out by African slaves through labor-intensive alluvial mining in the states of Mato Grosso, Minas Gerais but also in Bahia. In more recent times, discoveries of kimberlite pipes have been made across Brazil,

and in 1999, several thousand garimpeiros invaded the Cinta Larga reservation, which is located close to Brazil's Bolivian border, to mine for diamonds. Eventually, the Federal Police solved the issue but it is believed that diamonds worth more than \$ 40 million were smuggled before this occurred. This event and others prompted Brazil to become a participant of the Kimberley Process Certification Scheme in October 2003.

Today it is rather difficult to judge the exact scale of Brazil's diamond sector. Production in 2011 was estimated at roughly 36,000 carats valued at a little under \$5 million, and around 80% of this came from Mato Grosso state, but

as the majority of production is carried out by artisanal and small-scale miners (ASM), often referred to as garimpeiros, exact figures are hard to come by. In 2011 it was estimated that only a third of total diamond production came from commercial mining operations. One of the companies trying to invigorate the way that the world perceives Brazil's diamond potential is Lipari Mineracao, a junior that owns the Braúna project in Bahia, a former property of Vaaldiam Resources and De Beers. Braúna encompasses 22 kimberlite occurrences, with the B3 deposit currently being the largest and the best developed. In January 2013, Coffey Mining's mineral resource estimate revealed indicated resources of 1,781,706 carats and inferred resources of 926,401 carats. "In 2013 we saw our resource increase significantly and consequently, we have reworked our mine plan, and are now predicting an open pit mine with a lifespan of seven years and the potential to go underground after this. We expect an average sales value in excess of \$280 per carat, which I believe would rank as the fourth or fifth highest dollar per carat value for rough diamond production in the world. By world standards the output will be fairly small, at 230,000 to 250,000 carats per year, but this is compensated for by the excellent margins the project will be running at. Right now we are finalizing the engineering work in terms of mine design, geotechnical studies, and infrastructure, and we aim to break ground on the actual construction in the first quarter of 2014," said Ken Johnson, managing director of Lipari. While the scope of the Braúna project is relatively small, its potential success could have a large-scale symbolic impact on the way diamond mining is regarded in Brazil and in South America: "By the end of 2013 we should have finished all the detailed engineering and the mine design, ready to begin construction in 2014 and production in 2015. We will stay focused on Brazil, because in spite of its many difficulties, the geological potential of the country is almost unbeatable; there have been over 1,000 kimberlites discovered in the country, but only three or four have been properly sampled, i.e. a proper processing plant has been built and large-scale sampling has taken place. We are hoping that Lipari's mine will put Brazil back on the map for diamonds and open the door for some new investment in developing some of this potential," said Johnson. •



## Diamond Producing States in Brazil

Source: USGS



**LIPARI**

**DEVELOPING SOUTH AMERICA'S FIRST KIMBERLITE DIAMOND MINE**

Lipari Mineração Ltda. is a private Brazilian mining company focused on the development of its 100% owned Braúna Diamond Project, State of Bahia, Brazil. The Braúna Project is a feasibility-stage project which is expected to become South America's first diamond mine developed in kimberlite rock, the primary source-rock of diamond. Lipari's goal is to become South America's largest rough diamond producer.

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[www.lipari.com.br](http://www.lipari.com.br)





INTERVIEW WITH

Ken Johnson

MANAGING DIRECTOR  
LIPARI MINERAÇÃO

Could you bring us up to date on the current situation with your Braúna project?

In 2013 we produced a new resource estimate that was based on some additional exploration and sampling carried out on the Braúna 3 deposit. We took a vertical shaft down to 100m, which allowed us to get a look at some fresh kimberlite, and the results were exceptionally encouraging. Not only were we able to increase the grade, we have also seen our resource increase significantly, where it now stands at approximately 2.5 million carats. Consequently, we have reworked our mine plan, and are now predicting an open pit mine with a lifespan of seven years and the potential to go underground after this. We expect an average sales value in excess of \$280 per carat, which I believe would rank as the fourth or fifth highest dollar per carat value for rough diamond production in the world. By world standards the output will be fairly small, at 230,000 to 250,000 carats per year, but this is compensated for by the excellent margins the project will be running at. Right now we are finalizing the engineering work in terms of mine design, geotechnical studies, and infrastructure, and we aim to break ground on the actual construction in the first quarter of 2014.

What is Lipari’s experience of Brazil’s regulatory environment?

In terms of our interaction with the various agencies and authorities involved in the sector, we do have a positive relationship, but, as is the case all over the world, the time it takes to obtain permits and licenses is still one of the main factors affecting our timeline. In Bahia, there are currently many projects in the pipeline and INEMA, the state environmental authority, is struggling to process all these requests in a fairly short period. We also maintain a good relationship with the local community in the town of Nordestina that lies next to the Braúna

project. Our mine will be very environmentally friendly, as beneficiation of diamonds does not require the use of chemicals, and over 90% of the water used by our plant will be recycled. Furthermore, the total footprint of the open pit mine will be only 300 m wide, so it is far from a huge operation.

How do you see the recently passed legislation for the port sector and the new Mining Code affecting the sector?

We believe that there are certain aspects of these new pieces of legislation will certainly help the mining industry as a whole. The new possibilities opened up by the construction of private ports will certainly help the bulk commodity producers as iron ore and bauxite will become much easier and much less costly to export. Concerning the new Mining Code, there is a general feeling amongst industry players that there was no real need for drastic changes from the current mining code, although it is certainly true that in general the royalty rates were lower than the world average and it is understandable that the government wants to increase the contribution from the sector. However, it remains to be seen whether the switch from the priority system to an auction based approach for granting concessions will be a success. We believe it will result in a reduction of grass roots exploration here in Brazil. It also seems that problems could arise if public companies want to raise funds to invest in a mining project, where the title is based on an auction system: if they cannot guarantee that they will receive the mineral rights, how are they going to convince investors to invest?

Brazil is not known for its diamond production. What is your evaluation of the potential for the region to develop in this area?

Looking just at our own project, the quality of Braúna compares favorably with the best di-

amond mines in South Africa; the geology is very similar to some of the kimberlite mines you see in the Kimberley region, where there were several small fissure mines that were discovered as far back as the 1800s. Although Braúna is quite small, it has the potential to operate for 50 years. Taking a wider perspective, the potential for kimberlite mining in Brazil is huge; there have been over 1,000 kimberlites discovered in the country, but only three or four have been properly sampled.

What is the timeline for the remainder of 2013 and where do you see Lipari five years from now?

By the end of 2013 we should have finished all the detailed engineering and the mine design, ready to begin construction in 2014. The fabrication of our plant has already begun; half of it is being built here in Brazil, and half in South Africa; the South African equipment should be shipped in November and the Brazilian equipment in December. We plan to begin installation and construction in January, assuming that we have all of the necessary permits in place. Our processing plant is being designed in Cape Town by the South African firm ADP because they have a level of expertise in diamond mining that is hard to find anywhere else. Looking a little further into the future, our aim is to become the first diamond producers in South America, and beyond 2015 we will hopefully be looking at acquiring our next project. We will stay focused on Brazil, because in spite of its many difficulties, the geological potential of the country is almost unbeatable. •

Other Minerals

A rich diversity

While there is little doubt that Brazil underperforms in terms of the scale of its mineral production, the sheer breadth of the minerals it produces is worthy of mention. Aside from its major products (most notably iron ore), it produces a plethora of other minerals: 80 in total, including industrial minerals.

Some of these complement its existing production: it is the world’s leading producer of niobium by quite some distance (accounting for over 90% of the world’s supply) and in the global top 10 of manganese producers, both of which are used as alloys in steel. This makes Brazil, although only the second largest exporter of iron ore, the world’s foremost supplier of steel products.

Brazil is also a major exporter of copper, although the prevalence of other major producer (such as global leader and regional peer Chile), means that it falls outside the world’s top 10 producers. Significant investments planned between now and 2016, however, have the potential to just edge it into the rankings. Brazil holds the world’s seventh largest reserves of uranium, and is the world’s 12th largest producer, and is the world’s fifth largest producer of tin.

Most notable among these other minerals, however, is Brazil’s production of bauxite and alumina. The country ranks third among global producers (overtaking Indonesia last year), has the world’s third largest reserves after Guinea and Australia, and is the world’s second largest exporter.

Para state dominates bauxite production in Brazil accounting for 85% of overall output, while Minas Gerais produces the country’s remainder. A number of giants operate in the bauxite arena: Norsk Hydro, Votorantim, BHP Billiton and Alcoa: Norsk Hydro having massively increased its presences after acquired all of Vale’s bauxite and aluminum activities in a \$4.9 billion deal in 2010.

Mineracao Rio Do Norte (MRN) is a consortium of major bauxite producers operating out of the

Oriximina municipality in Para state, who overwhelmingly dominates Brazilian bauxite production. With shareholders including Vale (40%), Alcoa (18.2%), BHP Billiton (14.8%), Rio Tinto Alcan (12%), Companhia Brasileira de Aluminio (10%), and Norsk Hydro (5%), the firm boasts world-class expertise in possibly the most geographically challenging location for a mining operation in the world. Deep in the Amazon Rainforest, MRN’s operational site is serviced by its own airport, rail infrastructure and ports.

Outside the sheer geological richness of Brazil for bauxite and alumina producers, another driver of growth for the industry is the scale of domestic demand: as always driven by Brazil’s rapidly growing middle class. For this reason, the country’s major producers of bauxite are often involved not just in extracting the raw material but also the downstream refining and even manufacture of aluminum. Hydro’s Bauxite and Alumina Division is centered in Brazil: over 20% of the company’s 22,000 employees are located in the country.

“We are a fully integrated aluminum company in Brazil, from bauxite mining to downstream manufacturing,” explained Johnny Undeli, Executive vice president, Bauxite and Alumina, Hydro, describing the company’s strong upstream position in the country as “fundamental to the future of the company”.

“The move to Brazil was very important to Hydro and we are here to stay. It is very strategic to have a strong upstream position like the one we have here, considering the current aluminum market. This opens up good opportunities for our future as one of the leading companies in this business. Overall, we believe that aluminum is the metal of the future due to its characteristics, which contribute to a creating a more sustainable world, which is also one of our goals. Hydro has more than 100 years of industrial experience based on innovation and development, and despite the current challenges in the market, it will continue its path towards global leadership.” •

Expected Bauxite Production Growth to 2016

Source: IBRAM

	1000 TONS
Production in 2011	31 000
Increments by 2016	7 000
Expected Production by 2016	38 000
Change	23%

Bauxite Exports

Source: Aliceweb

	MILLION USD
2010	270
2011	319
2012	325

Investments in Aluminium-Related Minerals to 2016

Source: IBRAM

New Investments in the Mining Sector

	BILLION USD
2011- 2015	5 220
2012- 2016	3 417

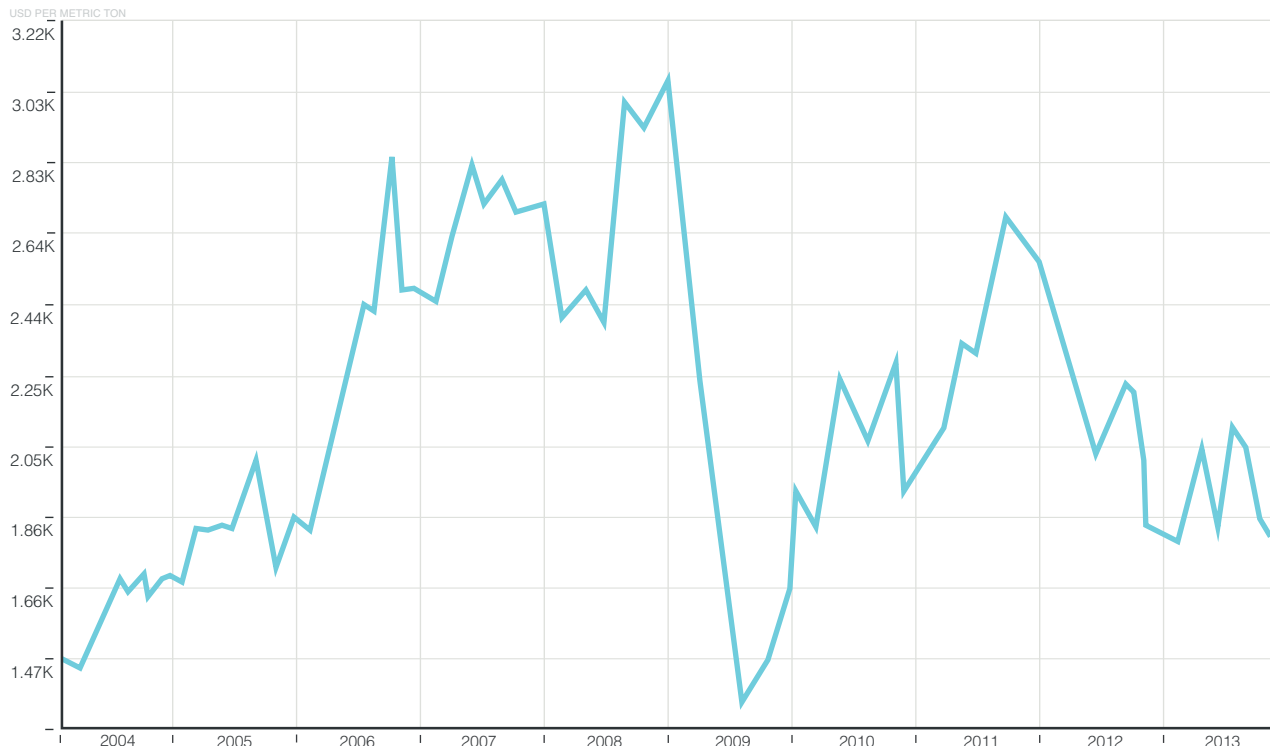
Brazil’s Bauxite in a Global Context

Source: PNM, IBRAM

Global Production	14%
Position in Ranking	3rd
Brazilian Reserves	6.8%
Position in Ranking	5th

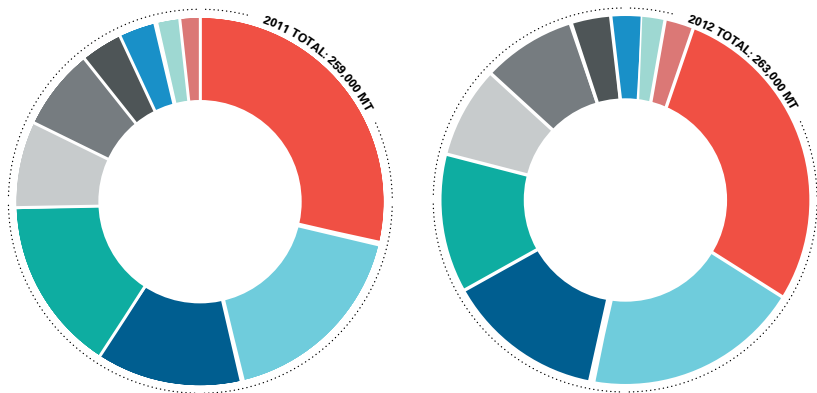
## Aluminium Prices

Source: World Bank



## Bauxite Production by Country (mt)

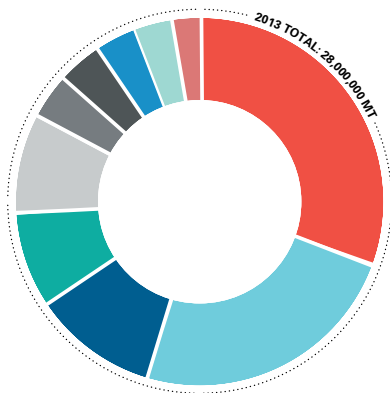
Source: USGS



COUNTRY	2011	2012
● Australia	70,000	73,000
● China	45,000	48,000
● Brazil	31,800	34,000
● Indonesia	37,100	30,000
● India	19,000	20,000
● Guinea	17,600	19,000
● Jamaica	10,200	10,300
● Russia	5,890	6,100
● Kazakhstan	5,500	5,300
● Venezuela	4,500	4,500

## Bauxite Reserves by Country (mt)

Source: USGS



COUNTRY	RESERVES
● Guinea	7,400,000
● Australia	6,000,000
● Brazil	2,600,000
● Jamaica	2,000,000
● Vietnam	2,100,000
● Indonesia	1,000,000
● India	900,000
● Guyana	850,000
● China	830,000
● Greece	600,000

## INTERVIEW WITH

## Johnny Undeli

EXECUTIVE VICE PRESIDENT, BAUXITE AND ALUMINA  
HYDRO

Hydro's Rio de Janeiro office was established in 1977. Could you provide us with a timeline of the main milestones that the company achieved in Brazil?

In Brazil, Hydro has world-class operations and a strong resource base and in 1974, we started our partnership with Vale, with a 5% ownership in MRN (Mineração Rio do Norte). In 1997, Hydro acquired the extrusion plant in Itu, in São Paulo (Hydro Itú), which is now undergoing a merger with SAPA. Later on, in 2000, Hydro also became a shareholder in Alunorte, the biggest alumina refinery in the world located in Barcarena, with a 34% ownership in the asset. However, our most important move occurred in 2010, when benefiting from Vale's divestiture, we acquired the bauxite mine Hydro Paragominas and became the majority shareholder of Hydro Alunorte (92% ownership) and of Albras (51% stake), a primary aluminum company also located in Barcarena, in the state of Pará. Additionally, Hydro also has bauxite mineral rights in Minas Gerais, Pará and Amazonas.

Brazil is the main source for bauxite for Hydro. What is the strategic importance of Brazilian operations to Hydro globally?

We are a fully integrated aluminum company in Brazil, from bauxite mining to downstream manufacturing. Given the potential of the assets acquired, a strong position in the upstream obtained in Brazil is fundamental to the future of the company, which became independent from the other suppliers and has high quality raw material for manufacturing aluminum and other downstream operations. Brazil is the second largest integrated producer of bauxite and alumina in the world and we are national leaders in bauxite trading and alumina refining, with 50% and 56% of the market shares in the country.

How is Hydro addressing environmental issues?

Hydro's environmental goals cover the most important aspects of our operations, air emissions, climate change (CO2 emissions), water use, landfilled wastes and mining footprint. For our latest expansion at Alunorte and for the construction of our new bauxite refinery, Companhia de Alumina do Pará (CAP), we have incorporated new equipment for emission controls that meet high global standards, which are much stricter than the Brazilian legislation in the matter. Another specific example is that by 2017, our bauxite mining activity in Paragominas should achieve a balance between the active mine and rehabilitation area, which means that for each hectare explored one hectare will have been rehabilitated.

Minas Gerais is traditionally known to be the mining state in Brazil but in more recent times, the state of Para has gradually gained more importance in the industry. What has been Hydro's experience in the Para and do you believe that the state can challenge Minas Gerais' dominant position in the mining sector in the future?

The state of Pará's relevance will grow since more mining and industrial activities are planned there for the near future. We've managed to establish a good relationship with different stakeholders in the region and we want to maintain a transparent dialogue with them in order to clarify expectations, share information and seek win-win opportunities. Although Minas Gerais has a larger experience, the state of Para is currently taking some steps in an attempt to structure the mining activities, which shall be done taking in consideration the challenges that companies like ours face and the need of a stable scenario to attract and maintain the planned investments.

How has the evolution of sectors such as transportation and construction impacted Hydro's business in Brazil?

Transportation and construction are important business segments for Hydro Itu and both are under some influence of the big events planned for Brazil in the years to come. Electronics and packing are not the focus of our business. The total extrusion market, even when one considers the upcoming events, is not growing up as fast as the experts had announced two or three years ago. The growth rate in 2012 was just above 2% and there are slim hopes for it going higher in 2013. The problem seems to be the industrial activity that is not receiving the necessary investment. Some industrial segments are under the threat of imports from China and other sources while inflation rates are moving upwards. Government authorities are trying to take actions that are supposed to correct the way things happen, but the effects so far have not been that good. On the other hand, Hydro Itu has just completed an important investment aimed to increase capacity and make its product line wider. We believe the investment will place Hydro in a much better position in the market in two or three years. Regarding key markets in the future, we are sure that building and construction will follow leading the way. Transportation applications (truck bodies, bus bodies, railroad cars, automotive parts, shipbuilding) will have a role, but not as important as building and construction. •



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# The Support Sector: Local and Foreign Services for Brazil’s Miners

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“We are very optimistic about the future for SRK Brazil; for a start, the country is about the same size as Australia, and several times the size of Chile. Our offices in these two countries both employ over 100 members of staff, so right there you can see the potential for our office to expand with the local mining industry. This growth could well be accomplished in the next five years, provided we can stick to our philosophy of providing the highest level of service and delivering value to our clients... By the time the New Mining Code begins to have an effect on the industry and the long-awaited new wave of investment starts to hit the sector, SRK Brazil will be more than ready to deal with the new influx of clients.”

- Cauê Pauli de Araújo,  
Interim General Manager, SRK BRAZIL



Courtesy of Anglo American



# Engineering and Consulting

How best to become Brazilian

The world's junior explorers struggled in 2012, with finance becoming increasingly hard to come by in overly cautious markets. Mid-tier producers and even the giants of the global mineral industry struggled as well, with prices for many commodities beginning a fall that has continued into the current year. Not surprisingly, the companies that service the industry, in just about any form, have struggled as well.

The legions of companies that cater to Brazil's mining industry have arguably struggled more than most. "The main reasons for this were the rising levels of uncertainty provoked by rumors about the New Mining Code, and the very real hold on exploration permits that the DNPM introduced last year. As a result of these factors, many important contracts were either postponed or put on hold for an undetermined period of time," said Cauê Pauli de Araújo, interim manager at SRK Brazil.

However, now that the new regulatory framework has been released, and requests for exploration licenses are being processed once again, there is a renewed optimism that can be felt throughout the sector. Work on several important projects is recommencing, and the increased certainty brought to the industry by the new code should serve to restart the flow of foreign investment. This is good news for Brazil's many engineers and consultancies, which are now fiercely competing to secure the most important contracts.

Today, Brazil's EPCM and consultancy sector enjoys a good balance between foreign and domestic firms, but this has not always been the case. "For many years, almost all project development in the country was carried out by American or European firms, who in turn were working on behalf of yet more foreign companies. It was not until the 1970s that Brazilian engineering and consulting firms really started to make an impact on the mar-

ket," said Jackson Oliveira Bragança, director of Belo Horizonte-based engineering and consultancy firm Tecnomin.

After this period, for many years the tables were turned definitively in favor of the domestic service providers. Historically, Brazil has always been a cost-driven country, and this can make it a hard market to penetrate for multinational companies, as they struggle to compete with the low costs offered by smaller, local service providers. Even today, there is often a problem with "the general mentality of Brazilian companies, which usually opt for the cheapest product or service in the market, omitting the long-term gains of engaging with a high quality solution provider," said Michael Booden, general manager of specialist lifting contractors Mammoet.

As well as the cost issue, some commentators point to another key factor that previously held back multinationals from establishing a firm foothold in Brazil. According to José Ricardo Barella, founder and chairman of home-grown engineering firm Progen, "international firms that came to Brazil in the past often made little effort to integrate into the Brazilian way of doing business. They were generally managed by foreigners, often with key decision makers located outside the country, and this made it difficult for locals to build constructive relationships with them." Now, however, several foreign companies are establishing, or re-establishing themselves in the country and are making a concerted effort to adapt better to the particularities of the Brazilian industry. Broadly speaking, there seem to be two main approaches to achieving this integration: the first involves building a purely Brazilian team from the ground up, starting a separate, wholly Brazilian operation in the country, whilst the second is to follow a course of mergers and acquisitions,

taking over local firms and thus establishing an immediate presence in the market.

DRA Mining's entrance into the country provides a good illustration of the former strategy. Already well established in Africa, and with a notable presence in Australia and Canada, the South African engineers opened their Brazilian office in January 2013 in response to requests from their international clients. "It is our clear intent to become 100% culturally Brazilian. In other countries we have seen many companies try and impose their own external systems on an alien culture, and we have seen these companies fail. Our aim is to blend our expertise with Brazilian talent to ensure that we gain the best of both worlds," said Paul Carlin, director, DRA Brazil. As a first step towards forging this Brazilian identity, the company intends to employ 70 Brazilian staff over the next six to eight months who will be based out of its new office in Belo Horizonte.

American-based Tetra-Tech Wardrop, on the other hand, opted to expand into the country through a series of acquisitions of local companies. "Tetra Tech uses its mining arm to gain footprints into new markets and then engages into further expansions based on that. That is precisely what has been happening over the course of the last few years in Brazil, where in June 2012 we acquired CRA Engenharia, a local mining engineering company, established in 2005 in Belo Horizonte," said Brent Thompson, president of Tetra Tech Brazil's mining division.

This one move added over 300 staff to the company's engineering and consulting division, and perhaps more importantly brought a wealth of local knowledge to the organization. That being said, the successful acquisition of a totally new company is by no means an easy option. "The process of properly integrating a company is complex, takes a

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## INTERVIEW WITH

# Javier Schmal

MANAGING DIRECTOR FOR LATIN AMERICA  
MARTIN ENGINEERING

What are the main products that Martin Engineering provides to the mining industry, and has the Brazil lineup seen any new releases recently?

Martin Engineering mainly focuses on conveyor belts themselves, but we also have a high level of expertise in flow-aids, and we are currently investing in expanding our own line of vibration products for heavy industry. At the Las Vegas Mine Expo last year we unveiled our new high-speed transfer point line, which can handle a much higher tonnage than any existing products on the market at much higher speeds. These are now available in Brazil and are currently being rolled out across Latin America. We also recently introduced our new wear plates that are manufactured in Australia in partnership with Alloy Steel. These are now and projects installed and undergoing trials in conjunction with some customers as Vale, Hydro, Alumar, ArcelorMittal, Sun Coke, Votorantim, Lafarge, among others at the most demanding applications with the results suggesting that they are performing far better than any similar offerings from our competitors.

What is the strategic importance of Latin America to Martin Engineering globally?

Latin America is very significant to the company and we believe that it offers some of the best opportunities for growth worldwide. The region is embraced from three main poles, Chile/Peru, Brazil and Mexico, although Brazil is where most of the team is usually based. Through our network of sales offices and licensed distributors we are able to achieve total coverage of these countries. In Brazil, by far the most important project we are working on is Vale's S11D expansion in Carajás, but we are also involved in some of their other projects such Vale Apolo, Vale Sao Luis Port and Samarco. In addition to this we

are collaborating with the main players in the industry as, MRN, AngloGold, Anglo Ferrous, CSN, NAMISA and Anglo American Iron Ore, among others, and we are working together with Votorantim at their new plants projects. In Mexico one of our largest customers is Grupo Mexico and Grupo Peñoles, with whom we are working on several projects, and we have just entered into a service contract with Arcelor Mittal to perform maintenance on all of their conveyor belts.

Could you explain the importance of R&D to Martin Engineering seeing that you are acting as a high-tech provider to the market?

Martin has a reputation of being a global leader in innovating conveyor products as well as flow-aid solutions and we are constantly seeking to offer, safer, more efficient and better quality products to our customers. R&D in Brazil is carried out in concert with our Centre for Innovation (CFI) in the USA. Much of the new innovation is being driven by our work at Vale's Carajás Complex at over 300 conveyor belts. Understandably, such an ambitious project requires new ideas and new production techniques, and all the new knowledge gained will be transferred to future projects. Thanks to our investment in R&D, Martin now has a clear advantage over the competition in terms of safety. To perform maintenance on most conveyor systems it is necessary for a technician to actually shut down the conveyor and enter inside to a confined space, but all of our new products have external access for maintenance operations. This has a huge impact not only on safety, but also on operational efficiency as it reduces downtime for maintenance and, having the right risk analysis and prevention, we can service our products as the conveyor is running, meaning that repairs and preventive maintenance requires minimum time.

How does Martin Engineering deal with the difficult situation in finding skilled labor in Brazil?

It is certainly a challenge to source skilled labor in the country, as there are simply not enough qualified personnel to meet demand, but Martin Engineering is investing in a strong internal training program to be able to develop our people and ensure that we have a good supply of new technicians in the pipeline for times of especially high demand. We also offer a series of classes through which we offer training not only to our own staff, but also to our customers' engineers and technicians so that they are able to use and repair our products to ensure that they keep performing at optimum levels.

What is your vision for the future development of the company in Brazil?

We see enormous potential for the future in Brazil: new legislative measures such as the new ports law will present a range of exciting opportunities for the country and for Martin Engineering. The impact of this new development will be felt by many industries, not only the mining sector, and we are looking to capitalize on this by enlarging our participation in strategic markets such as Brazil's agribusiness and alternative fuels industries. Looking specifically at mining, China's initial economy growth's expectation for 2013 was close to 7.7%, whereas now is this year growth has fallen to just 7.5%. The impact of this 0.2% decrease is already apparent as some important mining projects have been put on hold or scaled down. However, in spite of this, we are optimistic about the future and Martin is predicting year on year double digit growth in Latin America, thanks mainly to the contribution of Brazil, Mexico, Chile and Peru. •

54 ← long time and cannot be done overnight: this is one of the reasons why we look out for good firms, whose core values are solid; we do not try to change their essence but rather we work around the edges," said Thompson. Finnish EPCM specialist Pöyry has followed a different trajectory altogether. After first coming to Brazil in the early 1970s they solidified a strong reputation in developing engineering projects throughout the mine cycle in the 1980s, but then withdrew from the industry completely in the late 1990s. Today, they see fresh opportunities as the sector develops and they are now aggressively re-entering the market. The combination of strong local DNA and foreign infrastructure gives them a unique perspective to assess the challenges still faced by the sector. "Brazil's mining industry is not performing as well as it has in the past - in particular in terms of meeting deadlines and minimizing investment costs - and the main reason for this is the failure to adopt a holistic perspective on project implementation," said João Ronchel Soares, head of global mining and minerals at Pöyry.

Whilst Brazil is certainly not the only country in the world in which major engineering projects suffer from expanding deadlines and stretched budgets, the problem is particularly acute here. One reason for this is the common practice of larger projects being divided into several smaller subcontracts, and then for these to be awarded to a series of different firms. Such fragmentation frequently serves to obscure a clear view of the project as a whole. "There needs to be a lot more planning, working beforehand with the communities, preparing feed engineering, and taking into consideration all the aspects of project implementation," said Soares. Nevertheless, the main challenge facing the Brazil's engineering and consultancy firms, and indeed most companies involved in any sector in Brazil, is the country's lack of skilled labor, which has become something of a chronic affliction of the domestic industry. Whilst the 2012 mining slowdown has led to a slightly larger pool of skilled workers to

choose from, the simple truth is that there are not enough qualified personnel to fill the vacancies, particularly in remote areas. In the absence of sufficient quantities of qualified, experience personnel some companies are taking matters into their own hands. "Martin Engineering is investing in a strong internal training program to be able to develop our people and ensure that we have a good supply of new technicians in the pipeline for times of especially high demand," said Javier Schmal managing director for Latin America at the USA-based engineers and manufacturers of specialized conveyor belts Martin Engineering. Sotreq, South America's largest Caterpillar equipment dealer has also recently invested in a new 2,000 m2 training center to instruct its clients' mechanics in how to repair Cater-

pillar products. "We are currently training a group of 120 of our client's employees to be mechanics. When they came here they had absolutely no mechanical knowledge, but when they return to their employer in six months' time they will be well versed in repairing Caterpillar machines and will even have acquired a working knowledge of English," said Paulo Brasil, account manager for Vale at Sotreq.

Initiatives such as these certainly help to improve the situation, but it will take sustained government investment in education to really get to the heart of the matter. President Dilma Rousseff's proposal to earmark all royalties collected on the pre-salt oil for the public school system is a step in the right direction, but the effects will not be felt for several years to come. •

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Global Company

INTERVIEW WITH

# Michel Booden

GENERAL MANAGER  
MAMMOET

How would you characterize Mammoet's evolution and performance during the year 2012?

Last year brought many large new projects for Mammoet and our rate of expansion in 2012 greatly surpassed the rates for 2010 and 2011. It was a very good year; our growth was probably at around 100%. This performance was driven by projects such as the ones in the Rio Grande and Rio Grande do Sul shipyards, where our new Mammoet in-house develop cranes, the PTC 200DS-s, operated. These are very big machines, at over 80 m in height and 54 m in the ring's diameter. Mammoet even set a new world record for the heaviest load lifted at the highest altitude on the P55 Petrobras Offshore Deck, which managed to take 17 mt of weight at an elevation of 47 m. We are also happy to announce that we were awarded the contract for the largest windmill park in Brazil. The magnitude of the project prompted us to create a new company, Mammoet Wind Brazil, which will be responsible for the installation of 230 windmills in Bahia, for Renova; to achieve this, we have partnered with Irga, a Brazilian company that will be assuring the transportation of the windmills' components.

Right now, what is the relative importance of the chemical and mining sector for Mammoet's business?

Both the chemical and the mining component of our business are very important. Mining is essential at a worldwide level for Mammoet and in Brazil we focus more on working with the engineering companies in the field. The Brazilian chemical market is not as large a proportion of our business as we would wish, and most of our current focus is on offshore petrochemicals, but we are participating in other bids such as the one for a new fertilizer plant. Much of the time our end-clients are

Vale and Petrobras, seeing how the Brazilian economy is largely driven by these entities. Numerically, it is hard to establish a ranking since the relative importance of the industry sectors to our business is given by the projects Mammoet is currently involved in; for example, with the Renova windmill project, energy will become an essential component whereas now it only represents a small fraction of our operations in Brazil. The duration of these projects is also relative, as it can range from a few months to several years.

How significant is Mammoet Brazil to Mammoet's global apparatus and reach?

Brazil constitutes a very important market for Mammoet and we see great potential and opportunities ahead for us here. The foundations of the company were established here over 10 years ago. Now, we are looking to grow and to transform Mammoet Brazil into a regional office of significant importance to worldwide operations. The local work force is an essential element to our business and to that end we are spending time, energy and money to train local laborers; however, the highly specialized nature of our company prompts Mammoet to always have a certain percentage of highly-skilled foreign supervisors to oversee our operations. Overall, Mammoet's South American operations are evolving, with new projects being opened in Chile, Peru and Colombia.

What are the main challenges that you encounter in the Brazilian business environment?

The largest challenges faced by Mammoet in Brazil are governmental bureaucracy, the lack of adequate infrastructure, and the general inconsistency in maintaining schedules. On top of that, Brazil is a very expensive country to do business in, as taxes on equipment and labor are very high. These elements combined make

it very hard for us to plan ahead; yet the line of business we are in requires us to do just that, as our complex, value-adding solutions need careful analysis. Another problem relates to the general mentality of Brazilian companies, which usually opt for the cheapest product or service on the market, omitting the long-term gains of engaging with a high quality solution provider; Mammoet is confronting this trend and we are trying to change this type of mentality.

Mammoet is a project-driven business. How do these projects get selected and could you name some that stand out?

Given that the Brazilian market is so competitive, we do not have the luxury to pick and choose our projects; we fight for all the

opportunities we consider have potential. At the end of the day, Mammoet is the largest heavy transport and heavy lifting company in the world and we are able to mobilize and deploy resources whenever that is necessary. Vale's S11D project carries special importance to us given its magnitude and we have made a bid for the transportation and insulation of various modules needed to complete it. In the chemical sector, our biggest project is a fertilizer plant in Mato Grosso, which is being built by UF Entry, but owned by Petrobras.

What is Mammoet's long-term vision for its operations here in Brazil?

At the moment, Mammoet Brazil's focus is to supply solutions and compete in the top segment of the market, where clients understand

that quality comes with a price. We are looking for complex projects where we can provide full service, adding value for the client, and where we can put our superior technical expertise to work. Mammoet Brazil will continue to operate within this philosophy and we are aiming at becoming a fully mature organization, less dependent on our organization's head office. To that end, two new directors have been added to the company and we are expecting big progress over the coming years in addition to our recent exponential growth rates. •



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**MAMMOET**



## INTERVIEW WITH

# Brent Thompson & Odilon Mesquita

PRESIDENT MINING DIVISION &  
DIRECTOR  
TETRA TECH BRAZIL



Could you provide us with a brief history of Tetra Tech, its involvement in the mining industry and the importance of the recent M&A developments that have occurred in Brazil for the company?

Tetra Tech was founded in 1966 and at the time, the main focus of the company was to provide engineering services that were related to water management systems, such as waterways and harbors. In the 47 years that followed, Tetra Tech gradually expanded its geographical reach and it also diversified its portfolio in terms of market and industry coverage. Nowadays, with approximately 14,000 employees across over 350 offices worldwide, Tetra Tech provides consulting, engineering, and program and construction management services for a variety of sectors, including energy, infrastructure, oil and gas and mining.

The mining sector is one that is very strategic for Tetra Tech because of the international nature of this particular industry with the company currently having 15 mining offices across the globe; Tetra Tech uses its mining arm to gain footprints into new markets and then engages into further expansions based on that. That is precisely what has been happening over the course of the last few years in Brazil, where in June 2012 we acquired CRA Engenharia, a local mining engineering company, established in 2005 in Belo Horizonte, which focused on iron ore and precious metals. With this acquisition, we added over 300 employees to our Engineering and Consulting Services business, and we improved our local knowledge and understanding of the market, which is essential in today's internationalized business environment. It is important to note that previously, in 2011, Tetra Tech had also acquired Metalica Consultores in Chile that also had a small engineering team in Brazil. Our most recent acquisition in the mining business, however, is that of CRA's Environmental Consultancy arm, which further expands our presence in the country and in Latin America, with the deal

also involving CRA's Colombian office. Finally, as yet another sign of the strategic importance that Brazil has for Tetra Tech at a global level, the company grew its business here not only in the mining sector, but also in its core area of coastal expertise, by securing a Sao Paulo based oceanographic consulting firm with a focus in offshore oil and gas, called ASA, in October 2012.

Through these developments, we have firmly established ourselves in the Brazilian market, where we now have over 600 direct employees and contractors that are currently working on 13 projects for clients such as Anglo American Iron Ore, Yamana Gold, Samarco, and Carpathian Gold. Overall, we are being very bullish about Brazil and looking back, you can see four important deals that were made in the country over the last two years, deals which have allowed Tetra Tech to gain a strong footprint and to establish itself as a permanent player in the market there.

Tetra Tech has a long history of M&A based growth – how do you manage the integration process with the companies you acquire and what are the main corporate values and competencies that define Tetra Tech?

Tetra Tech has lot of experience when it comes to integrating companies within its structure because much of the growth that Tetra Tech achieved during its history was M&A based. That being said, the process of properly integrating a company is complex, takes a long time and cannot be done overnight – this is one of the reasons that we look out for good firms, whose core values are solid; we do not try to change their essence but rather we work around the edges. We maintain dynamics within these companies and this was the case with Metalica Consultores, CRA and ASA as well, and we are very pleased with the way the integration process has been going. One of Tetra Tech's main advantages comes from its diversified portfolio and its extensive market and industry reach. This flexibility allows us to avoid temporary fluctuations and cycles in some areas by leveraging the sectors that are profitable at that given moment. Another advantage that derives from this flexibility is our capability to create synergies between our various business units, which operate in sectors that are often interlinked. Moreover, Tetra Tech's global structure allows it to constantly improve the quality of its services, by internally sharing and solving customer issues and requests. Being close to our clients, working with them and not for them, is essential for Tetra Tech and CRA helped us a lot in that respect, since they already had good long-standing relationships with important players in the Brazilian market.

Brazil's mining industry has been influenced over the past year by the prospects of a new regulatory framework. What is the current status of the mining industry in the country, as perceived by Tetra Tech?

The mining business in Brazil over the past year has been affected by the uncertainty caused by the much-awaited release of the new mining code. Moreover, the sector was also negatively influenced by the block that the DNPM issued on new permits and licenses and the overall global economic environment, where investors are being very careful and selective about the projects that they are placing their money in. A problem that many producers confront themselves with nowadays is not being able to deliver projects on time and within budget; this, in turn, makes it even more difficult for them to attract and convince investors to put money into their projects. This is an area in which service providers need to step in and Tetra Tech prides itself with the promptitude and the efficiency of its work and consequently, in Brazil, we have a healthy stock of projects on the go at the moment.

Could you highlight some of the main projects that Tetra Tech is currently involved with in Brazil?

With Yamana Gold, Tetra Tech is currently in-

involved in the basic and detailed design engineering for their gold ore beneficiation plant at Pilar de Goiás, which will have a capacity of 145,000 ounces per year. Another gold project that we are working on is Crusader Resources' CASCAR, where we are doing the definitive feasibility study, which will be followed by an EPCM contract, based on the approval of the Capex and Opex. In construction management, Tetra Tech is collaborating with Rio Novo Gold for a green field ore beneficiation plant located in Tocantins state, at the Almas gold project. Finally, one of the most recent contracts that we received was for Centaurus Metals' Jambreiro Iron Ore Project, where we will take charge of detailed engineering and procurement.

The most important project that we are involved in at the moment however is Anglo American Iron Ore's Minas Rio, where Tetra Tech has about 450 people working on the construction management of the beneficiation plant and filtering area at the Conceicao da Mato Dentro site, in Minas Gerais. Minas Rio is an integrated project which consists of a mine, a beneficiation plant, a 525 km slurry pipeline and a dedicated port terminal and it is one of the largest developments currently going on in Brazil. Tetra Tech is engaged in field supervision during all the construction phases at the plant and the filtering

area, including earth movements, drainage and steel structure erection; we also deal with the training of the contractors and the environmental and quality assurance activities.

IBRAM data suggests that investments in Brazil's mining industry will be driven by key minerals such as iron ore, fertilizers and even rare earths. Where do you see the industry heading and what are the plans in store for Tetra Tech's future in Brazil?

We are very confident about Tetra Tech's future in Brazil, where we plan to grow considerably over the next few years; even now, our operations here are the biggest contributor to Tetra Tech's mining business unit at a global level. The current economic climate and the still undefined regulatory framework have affected the mining industry but for the remainder of the year 2013 we still have plenty of projects to work on. Brazil's proficiency in iron ore, as well as its undeveloped resources in potash and even in rare earths, creates strong fundamentals for the industry to attract new investments and we believe that this will be noticeable as early as 2014. Tetra Tech's acquisition based policy has allowed it to establish itself as a strong, permanent player in the Brazilian market and we are here to stay and to grow. •

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## INTERVIEW WITH

# José Rogerio de Paula e Silva

MANAGING DIRECTOR  
ESCO BRAZIL

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Could you provide us with an update on the main milestones for ESCO Brazil over the past two years?

In spite of Brazil's subpar economic performance in 2012, ESCO enjoyed considerable success, growing substantially and improving our product portfolio. Our most important achievement of recent times was the opening of our factory in the mining hub of Carajás in the state of Pará. The plant now employs approximately 120 people and provides services producing, repairing and refurbishing excavator buckets, truck bodies and wear materials for mining companies in the northeast region. We have also opened a production facility in Sorocaba, São Paulo, to service the many OEMs that are located in this area. While this is a much smaller operation, employing some 30 staff, we expect to see it grow in the near future. Aside from this, we have just launched a new fleet of mobile service trucks that act as a one-stop-shop for repairing our products. By sending our engineers and the tools that they need into the field, we minimize downtime for our clients and avoid the need for bringing heavy machinery to one of our plants.

In such a crowded marketplace, how does ESCO seek to differentiate itself from the competition?

We are a company that invests in innovation and sustainability, and we also have a well-deserved reputation for developing high-quality products and delivering value to our customers. But ESCO's real competitive advantage is to be found in the close, long-term relationships that we foster with our customers. In mining, it is very important to know exactly what a customer needs in order to be able to tailor a solution perfectly to them, and we are able to do this by working very closely with them, listening to their needs and modifying our services accordingly. We also provide ex-

tensive aftermarket care and offer a range of extra services, all of which are geared toward our guiding principle of selling value to our customers. If a company simply sells products it will be able to stay in business for a matter of years, but if a company sells value then it can stay in business forever.

How important is research and development to ESCO's Brazilian operations?

Research and development is a fundamental pillar of ESCO's corporate philosophy, and in order to stay ahead of such a fast moving market it is of paramount importance to invest in innovation. In this respect, it is vital to be able to count on good quality personnel and ESCO attracts some of the best engineers in the country, all of whom are committed to improving our existing product lineup and developing new solutions for our clients. Brazil has an important role to play in this process, as our development center contributes new designs and technical projects to the global operation; within the company ESCO Brazil is recognized as being particularly strong in the development of new buckets, truck bodies and wear materials.

Sustainability is a key concept in today's business world. To what extent is ESCO involved with sustainability initiatives here in Brazil?

Sustainability is a cornerstone of ESCO's operations both worldwide and on a local level. In Brazil, we participate in Vale's Carbon Disclosure Project in an effort to reduce our emissions and minimize our energy consumption. Additionally, all the waste generated at our facilities is recycled and we have agreements with several environmental management companies who collect our scrap metal, take it to a foundry and reuse it in new products. We also consider our worker safety to be a part of running a sustainable company, and happily ESCO Brazil

has one of the lowest incident rates across the industry.

The northeast of Brazil is booming at the moment with large investment across a variety of sectors, including mining. What impact is this trend having on ESCO?

It seems that everyone's eyes are focused on the northeast at the moment; just looking at the state of Pará we can see that the mining sector there has been growing by 10% to 15% per year for the last five years. Alongside the new mining projects we are also seeing a range of infrastructure projects being developed in the region, which will obviously provide many business opportunities for ESCO. With our new plant in Carajás we are strategically located to take advantage of this boom and are prepared for the expected increase in demand that will occur in the coming years. We must also consider the effects that the release of the new mining code will have in Brazil: when it is finally delivered it should release a wave of new investment across the country and ESCO will be ready to rise to the challenge and provide our customers with the products and services they need to remain competitive and productive.

What is your vision for the future of ESCO Brazil?

This year ESCO is celebrating its 100th anniversary, and our long-term goal here is to one day celebrate 100 years of operations in Brazil. To accomplish this, we aim to stay ahead of the industry and maintain our competitive advantage, anticipating the needs of our customers and refine our solutions, both in terms of the products we offer and the services we provide. When the long-anticipated mining boom kicks in we will not be following the market, we will be ahead of the market, ready and waiting to provide our customers with the high quality of service that they expect from us. •

# Technological Advances

To a safer and more efficient mining environment

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Mining in Brazil has typically been viewed as a fairly conservative domain, in which technological innovation has often been dismissed as nothing more than an attempt to disrupt the status quo, but today there are signs that this old fashioned outlook may be undergoing a transformation.

Australian slope stability radar developer Ground Probe offers a variety of solutions to deliver increased pit wall stability in open pit mines, and they are feeling the effects of this change as it happens. The company opened its first Latin American office in Chile in 2006 and came to Brazil in 2012. "Although most engineers we speak to are very enthusiastic about our products, they have some difficulty upselling them to management. On the other hand, we have visited 90% of the major mines operating here and we have definitely caused a stir. The market may be slow to get moving but many experts outside of Ground Probe have predicted that within five years our products will be more popular here than in Chile," said David Ogan, general manager for the Americas.

In recent years the industry has seen an ever-greater focus on safety, which has been further heightened in the aftermath of the landslide at Rio Tinto's Bingham Canyon mine in Utah, and Brazil is no exception to this trend. Canadian CAE Mining is seeing increased demand for its simulation and training services, which allow heavy machinery operators to gain valuable experience and better prepare them to deal with the challenges they will face when it comes to controlling a real machine. The company's president, Damian McKay, considers this to be indicative of a systemic change in the industry: "A few years ago, the decisions on whether or not to adopt our solutions were left to specific engineers or geologists whereas nowadays we are witnessing more corporate, strategic decisions being

made by companies as a whole".

Nevertheless, McKay believes that there is still room for improvement. "The industry would benefit from governmental top-down legislation that makes certain standards - for example, a minimum of 100 hours of simulator training for a truck driver - mandatory."

In addition to the clear gains in worker safety that technological developments bring to the mine site, adopting the latest innovations can lead to a profound impact on operational efficiency, which ultimately translates into lower costs and higher profits for the operators. From its first forays into fleet management applications, Brazilian software house Devex has now positioned itself at the forefront of the wave of automation that is sweeping the industry, and has managed to capture 85% of the market share in their home country. The company has recently launched two comprehensive software suites, Extreme and SmartMine UG, which provide automation solutions for every step of the mining chain for both open pit and underground projects.

"Devex is just starting to optimize the whole process, but already we usually report seven to ten per cent gains from optimization of the mining operations. These gains can come from unexpected places; for example, our underground system incorporates a simple device which can switch the ventilation on and off and move its position around easily," said CEO and founder, Guilherme Bastos Alvarenga. •

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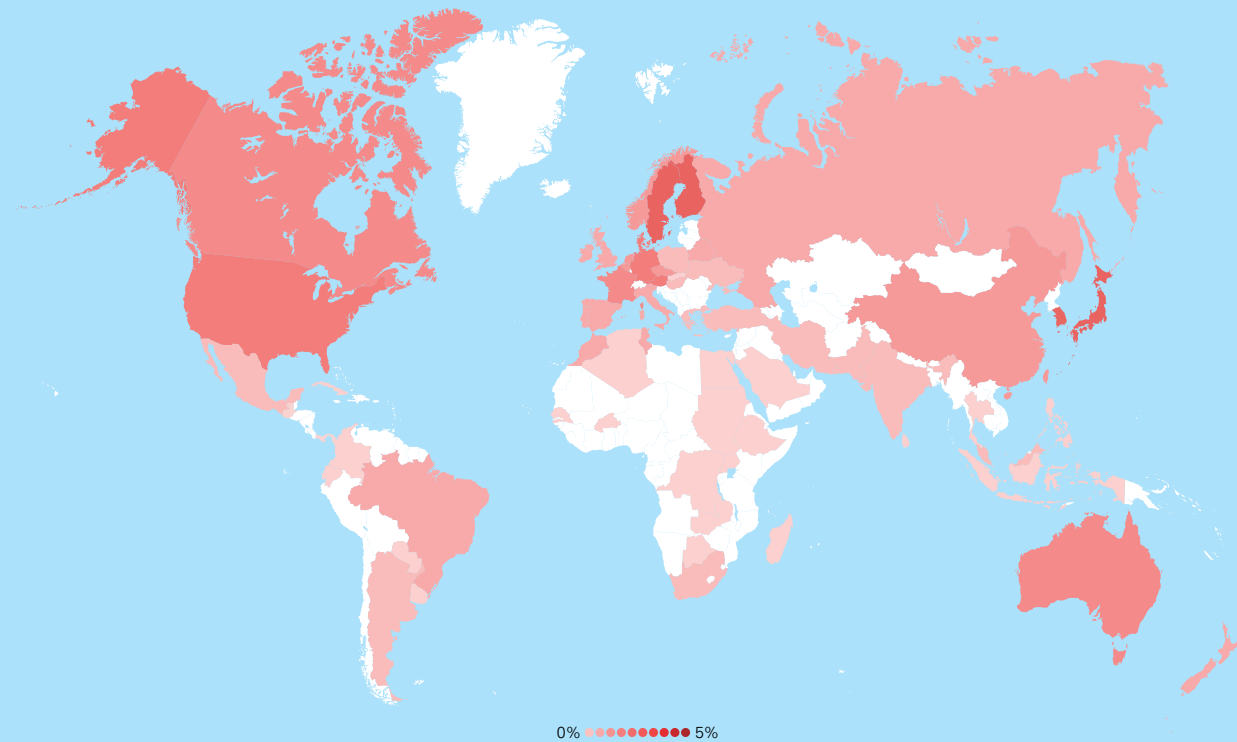
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**ORICA**

## INTERVIEW WITH

Felix  
TorresVICE PRESIDENT FOR DIVERSIFIED CUSTOMERS  
ORICA MINING

Could you give us an overview of Orca Mining's operations in Brazil?

Orca mining services has been in the Brazilian market for over 50 years bringing technology and state of art products to this market, as well as many businesses involved in construction and quarrying. The construction industry is becoming increasingly important to us as, thanks to the forthcoming mega-events, there are several important projects being developed in this area whereas the mining industry has suffered in the last couple years. In fact, our business is now divided almost equally between mining and Q&C, whilst in other countries such as Chile mining accounts for nearly 90% of our work. We usually deal directly with the mining companies and construction companies as there is not yet a strong explosives distribution network established in Brazil.

What products does Orca Mining offer to the Brazilian market?

The whole portfolio from Orca Mining's global product lineup is available in Brazil. This ranges from packaged explosives to bulk emulsions, as well as a wide variety of initiation systems that includes conventional devices in addition to the most cutting-edge electronic solutions. In this way Orca is able to cater to any explosives needs in the construction or mining industry, from small-scale quarrying applications to much larger tunneling and mining projects. Throughout Latin America, mining houses have begun to recognize the value of adopting new technologies, even though the initial cost may be higher than that of more traditional methods. That being said, some segments within the industry seem to be more open to innovation than others: in particular gold, coal, and copper mines are quicker to turn to new developments than producers of bulk commodities such as iron

ore. In the past Brazil has lagged behind its neighbors in terms of turning to new innovations, but it is slowly starting to catch up with more advanced mining jurisdictions today.

Beyond the sale of products, what extra services does Orca Mining offer to add value to its clients?

Services are very important to Orca, and we have a slightly different philosophy to most explosives companies. At the most basic level, what our clients need is for a certain quantity of rock to be blasted to a given size so that it is ready to be processed in their plant. Rather than seeing our role as that of a simple explosives provider or blasting contractor, we base our services around delivering rocks to our customers' exact specifications. We prepare the rock so that it is ready for the mill and, at the same time, ensure that there is no ore dilution at the mine site. With some large customers in Brazil we are already in full steam with the service concept where we are responsible for the whole chain of rock preparation from the loading of the explosive charges all the way to delivery to the mill itself. As such, the value we bring to clients is a lot more than the price that you see quoted on our invoices. Aside from our rock delivery service we also offer vibration reduction consulting. Demand for this service has increased enormously in recent years as many quarry and mine sites have moved closer to residential areas. We help our clients to carry out the blasting work that they require without negatively affecting local communities and staying within the boundaries set down by Brazilian law.

What differentiates Orca Mining from a smaller low-cost blasting contractor?

Whilst there is certainly a space in the market for the smaller local consultancies that offer very specific services, Orca Mining is able to

deliver a total solution to our clients. We can provide for all our clients needs from blasting to ore recovery, whereas if they follow the route of working with a number of smaller companies then the services become split up, with one firm providing the explosives, another carrying out the drilling work, and another assisting with vibration reduction. This makes project management infinitely more complicated.

We also stand out for the quality of our personnel. Finding and maintaining a well-qualified workforce is a challenge in Brazil, but we have a very effective worldwide graduate program through which we have been able to source a large number of professionals. In Latin America alone we have recruited some 65 individuals over the last five years who are now becoming the new generation of managers and leaders within the organization.

How have you seen safety regulations for explosives handling develop in Brazil in recent years?

With regards to security and explosives storage, regulation has become much stricter in Brazil in recent years, primarily in order to combat the serious problem of criminals stealing charges and using them in ATM robberies. On the other hand, the legislation pertaining to on-site handling is very old and is becoming quickly outdated. In this respect, safety standards are actually being driven forward by the mining companies themselves. Multinational producers such as Vale and Anglo-American have their own regulations that go far beyond what is set down by the law, and this serves as an example to other companies operating within the country. •



INTERVIEW WITH

# Marcelo Stenzel

MANAGING DIRECTOR  
SGS BRAZIL

Both the mining sector and the chemical industry in Brazil have been affected by negative market conditions during 2012. Could you tell us more about SGS' developments in these markets during the past 18 months?

The minerals area did not perform very well in 2012 and the DNPM block on permits definitely affected the market negatively; even so, this sector is still responsible for about 18% of our business in the country and worldwide. Furthermore, SGS is seeing movement already in the industry, which has a much better performance in 2013 so far than in 2012 and we hope that the second semester of this year will be even better than the first. For the mining sector, we provide services on the trade side, in ports, where we carry on inspections in terms of the quality and the quantity of imports and exports. We are also very strong in the fertilizer industry, which is very important here in Brazil, given the country's agricultural production and potential. Finally, SGS has a long-standing partnership in the minerals area with GEOSOL in Brazil, with which we have a joint venture called SGS GEOSOL. This business operates a geochemical analysis laboratory in Minas Gerais and right now, it is preparing to inaugurate its first pilot plant for metallurgical processes as well. The chemical industry is also very important to us and it also accounts for about 20% of our revenues in Brazil, where we are very well positioned in the trading that goes on in the ethanol market.

What are the main strategic geographical areas for SGS in the country?

Currently, SGS has 30 offices and 72 locations in Brazil. The NE region of the country is developing at very fast rates and its evolution over the past 10 years is truly impressive, with shipyards, refineries and petrochemical complexes being constructed there. Many people talk about the importance of the World Cup

and the Olympics but if you take a step back to analyze things, the investments related to these events are not nearly as important as the overall evolution of the North and Northeast of Brazil, which is far more significant to the country than the construction of stadiums. SGS is getting more and more business in the region and this year, we opened a new branch in Recife. The office has 150 employees, and the areas that we are targeting there are industrial services, calibration of valves but also services related to ethanol trade. Camacari is another important strategic location for us and we already have an operational laboratory running in Aratu, which is our third largest in the country, after the one in Santos and the one at our headquarters, here, in Barueri. With the investments that BASF is making in Camacari, we are expecting to see even more business in the area and SGS is planning to invest further in its Aratu operation during the second semester of this year, by improving the analytical capabilities of the laboratory.

How do you perceive the regulatory framework and the private sector initiatives in terms of environmental, health and safety standards in Brazil? Are there any other positive legislative developments that you have seen recently?

One regulation that has tremendous potential to help SGS is the MP 595, the new ports investment law. All the industries would benefit from a better port network in Brazil, and SGS is losing opportunities every year because businesses are not able to export their products. In recent months, we have seen bottlenecks and lines of trucks that went from Santos port all the way to Sao Paulo. When it comes to environmental and safety standards, Brazil has a good regulatory framework but the main problem is the lack of proper enforcement of these laws. Furthermore, there are various degrees of compliance depending on the re-

gion of Brazil that we are talking about and that adds to the overall lack of efficiency. The country is going to have a sound safety culture only when it is going to match its good legislation with good enforcement because ultimately, if you let people do whatever they want, they will always find the easy way out of things. In terms of private sector initiatives, if you look at ABIQUIM and ASSOCIQUIM, and their Responsible Care and PRODIR programs, you can see that their standards match international quality levels. This comes as a result of the good internal work that they have done but also due to the fact that the chemical sector is usually concentrated in big industrial sites, where compliance can be assured more easily than for other businesses that are scattered geographically and depend more on governmental enforcement to keep the compliance levels.

What are the core values that define SGS in the market?

SGS has very high standards of quality for its laboratories and field services and it also has good qualified personnel, whom we train at our SGS Academy, in Sao Paulo. These are competencies that cannot be grown overnight and we have a lot of experience in the market, where we are very well positioned, not only geographically, but also in terms of portfolio and client base. The company has its 2014 Strategic Plan, which is essentially a growth plan that also puts emphasis on better margins. SGS is confident that it can reach its goals by next year and here, in Brazil, we have already gained a couple of points in margins, by improving our operational costs and by changing our portfolio to higher profitability products. The final message is that SGS is planning on doubling its size in Brazil over the next four years by taking advantage of its new acquisitions and expanding their service reach to new geographical areas of the country. •



INTERVIEW WITH

# David Ogan

GENERAL MANAGER AMERICAS  
GROUNDPROBE

Can you give us an overview of the main products and services that Ground Probe is providing in Latin America?

Generally speaking, we sell decision confidence, which comes from very precise data regarding movements in a mine slope wall. Our main product is our Slope Stability Radar (SSR), which remotely scans a slope wall, providing a detailed analysis of any movement in almost real time, giving engineers increased confidence in their risk management strategies. The radar comes in two sizes: the smaller dish has a range of 90m to 1200m, and the larger works from 90m to 3,500m. In 2010 we introduced another product, the Work Area Monitor (WAM), which is a smaller, truck-mounted system that provides slope information even more rapidly and sends an alarm to the operator and to the engineering office to warn of any impending movement. Our systems are built to military specifications and can withstand even the harshest of operating conditions, with a tested temperature range of 25°C to +60°C. We can also provide full-time operators to our clients, provide remote diagnostics and preventative maintenance, and most often we train their own technicians to use the equipment and make the most out of the data that they receive. In certain circumstances we conduct remote analysis of data from our HQ in Brisbane and provide regular reports to the mine operators.

What are some of the tangible benefits of Ground Probe's products and solutions for a mine operator?

The first benefit is increased safety for workers. Worldwide, we have now predicted over 500 slope failures and we were able to give early warnings on each occasion. By giving advance notice of any movement, engineers can also react to the threat by reinforcing a wall and minimising ore dilution from waste falling into the ore zone. It also means that they can make preparations for alternative access if they know that an entry road is going to be blocked. Aside from these main uses, there is also the potential for all the data gathered over the course a project to be used in mine planning applications to improve the structural integrity of future slopes. Vale's Mine Closure unit has also expressed an interest in using our products to monitor mines after their production cycle has finished, in order to avoid landslides into populated areas or tailings ponds, which could cause major damage to the environment and risk human lives.

The mining industry, in general, has a reputation of being quite reluctant to adopting new technologies and solutions. Is this an

issue that Ground Probe has encountered and what is the current market acceptance today?

It is true that the industry in Brazil tends to be fairly conservative; although most engineers we speak to are very enthusiastic about our products, they have some difficulty upselling them to management. On the other hand, we have visited 90% of the major mines operating here and we have definitely caused a stir. The market may be slow to get moving but many experts outside of GroundProbe have predicted that within five years our products will be more popular here than in Chile. As a measure to educate the market we are carrying out several shared cost demos where we work with engineers for a week and provide them with all the data that we gather and then explain how to make the best use of the new information. They are then in a much better position to persuade their superiors to purchase our solutions. •

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## INTERVIEW WITH

# Guilherme Bastos Alvarenga

CHIEF EXECUTIVE OFFICER  
DEVEX



Could you provide us with an overview and an update of the main milestones that Devex achieved over the course of the year 2012?

Devex has invested heavily in new technology over the past three years. We are now running pilot projects using the portfolio of solutions developed in this time and these include a broader degree of remote automation for mining operations. For the last 20 years, fleet management systems were the only solution available for enhanced safety and productivity, but Devex's background in process automation allowed us to see the potential for new innovations. When we spoke last year, our products were still in development, but they have since been embraced, and had their value demonstrated, by one huge project in Brazil. The idea behind this project was to prove the added value of the total automation solution that we provide, which includes the control of various mining variables from a safe, remote location. Our new technology can be used for open-pit (under the name Extreme) and underground mining (SmartMine UG); we are going through a very special moment for Devex, as the pilot program that we are currently running will constitute a very good basis for our future internationalization. Extreme and SmartMine UG use the same concept of open architecture to monitor everything the customer wants. However, there are different building blocks you can add to the platform. The SmartMine open-pit product, which we have offered for years, is only focused on fleet management. The new SmartMine UG automation package is completely different; it just uses the same brand name.

Is Devex the only company to offer a complete underground automation product, and do you see your future growth (both domestically and internationally) deriving from it?

Certainly – no other company today has the DNA to take the same approach as Devex. Truck-makers do not have a strong understanding of automation as a process, even if they can automate machinery very well. Few companies know how to optimize activity in one area of a mine on the basis of events in others. Other companies can automate specific items, but we are the ones able to integrate all the information and empower operators to act upon it. Our ideas are not new – the mobile side of mining is a bit behind other industries like oil and gas, chemicals and even mineral processing. Devex has postponed its internationalization somewhat as it waits for its new range of products to be made available. Of course, because Brazil has companies like Vale, Kinross and Yamana that also operate abroad, we have started some international initiatives, but the process will only really begin in 2014. We partner with CAE Mining in such markets as Australia, Canada, Russia and the former Soviet republics, and India. Our products are slightly different from theirs, but we share a common vision. Devex, which has other international partnerships and intends to grow through the creation of further ones, now has offices in Belo Horizonte, Chile, Peru and Australia.

Devex holds 85% of the market share in Brazil. How did you achieve this and how are you finding the market's acceptance towards your innovative solutions in the country?

Our 85% market share in Brazil is measured in terms of sites. It comes as the result of the flexible approach we built Devex upon, and the important integration services we can provide to clients. Our growth has been rapid, as we have only focused on mining since 2001. Regarding the market's acceptance of new products and solutions, the

situation is currently changing. In the past, Devex dealt only with operational managers; now there are many more stakeholders in the conversation, because our products can be integrated with other automation systems. We speak to customers' IT and automation departments – people with a vision for the future. This makes it easier to sell new technology. It is no longer just about productivity. Companies want us to help them with safety, security, maintenance and their environmental performance.

Are you considering introducing cloud storage to facilitate more efficient use of data and how can your customers help improve your solutions?

Devex is considering cloud storage although our clients do not like the idea of saving data this way, mainly because our solutions capture so much crucial information about their projects. Customers can certainly suggest improvements to our products – it is very important to us that they do. Devex is in a transitional phase today. We always offered customizations in the past because, although they were not easy to implement and made us little money, we knew they were important to the customer; now they are much easier and more profitable because we already have the appropriate platform to perform integrations. It is happening already in our pilot projects. The clients are demanding certain innovations, and we try to work with their ideas. Our technology is constantly improving.

Do you have any facts or figures on the cost-savings that Devex's solutions can bring to its clients?

Devex is just starting to optimize the whole process, but we usually report seven to ten per cent gains from optimization of the mining operations. However, there are other

advantages as well; for example, our underground system incorporates a simple device which can switch the ventilation on and off and move its position around easily. Believe it or not, ventilation systems in underground mines used to stay on all the time.

How have Brazilian safety regulations for mining evolved in recent years and how has this impacted Devex's business?

In Brazil mining companies are ahead of the regulation. I do not think this is because the rules are weak; the industry here – especially companies like Vale – takes safety extremely seriously. Even when market conditions are difficult, they do not reduce spending on safety. Devex represents SAFEmine in Brazil;

even without regulation for it, we see good opportunities for this type of product.

What impact do you believe the much waited for new mining code will have over the industry in Brazil and how will Devex benefit from it?

Everyone expects the mining code to be changed, because the current one lacks clarity. When it is obvious a change is coming, whether for better or worse, everyone waits for it before making a decision. It will therefore be good when the situation is made clearer for international investors. The actual terms of the new code will not have much effect on Devex – the current uncertainty is worse.

What is the mid and long term vision that you have for Devex as a company and where will we find you if we return to Brazil in the next five years from now?

Devex's vision is to surf the wave of remote mobile automation, which will become a major trend in the industry during the next few years. In the current constrained international market, there is no doubt about the need for automation in mining. We feel we are making investments in the right areas, and Devex is expecting to see good returns on them in the next five years, both in the domestic market as well as on the international one. •

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INTERVIEW WITH

# Damian McKay

PRESIDENT  
CAE MINING

CAE's Mining division is a relatively new development. Can you tell us how it came about and what is its strategic importance to the company as a whole?

CAE is a global company, based in Canada, with offices and training centres in more than 30 countries. CAE is actually the world leading provider of simulation and training for civil aviation and defence. The mining division was established in 2010 when CAE acquired Datamine, a geological data and mine planning software company. Although it may at first seem surprising, there are a lot of parallels between aviation and mining – they are both mission-critical, in both markets safety is an imperative, there is little margin for error, and the cost of training on real equipment is very high. We are leveraging technology developed and best practices developed for aviation, particularly with regards to simulation and 3D imaging, in our mining sector. Compared to CAE and its 65 years of experience, it is still the beginning for CAE Mining but we are leveraging the knowledge and expertise of CAE into the mining industry. In the mining sector there is a tremendous amount of opportunity in terms of improving the safety and efficiency of mine operators through simulation technology and training. We have observed that the industry is hungry for advanced technology and training systems.

Over the past year, there has been an unofficial hold on new exploration and development permits in Brazil's mining industry, due to the country's new and much awaited for Mining Code. Has it impacted heavily on CAE Mining?

The hold on exploration permits affects our customers, in consequence it affects us. In spite of this, in 2012 we continued to grow in Brazil mainly because of large-scale iron ore projects and the high price of gold.

In Peru we saw even stronger growth due to a combination of the booming Peruvian economy, our readiness and ability to tailor solutions to our clients' needs, and our investment in product development. We have also established a presence in Latin America through a series of agreements with well-known mining companies such as Vale, Anglo American, and AngloGold Ashanti in Brazil, and Votorantim, Milpo, Minsur and Volcom in Peru and we are bullish about our future in these markets.

CAE Mining offers a broad range of services: software, training, consulting and simulation. How do you group them to deliver the best possible package to clients and what are some of the cost savings that you can help achieve?

CAE mining offers a broad range of mining management software to our clients, from geological data acquisition to mine design and mine scheduling applications. These are all modular solutions that integrate together using cloud processing technology, so data from one application is automatically incorporated into all other areas. We are currently developing a new software platform, Summit, a Microsoft-based workspace that will integrate all our existing products into one system. Summit will not be launched for another year but our tests have shown that this complete package can reduce the time to complete a given task from nearly two weeks to between four and five hours. Other solutions in training and simulation prevent the malfunction of equipment and trucks that can cost up to \$7 million and additionally, our software helps our customers in the day to day operations. Safety costs are also an issue we are helping to reduce, since we are preventing worker injuries that translate into additional expenses for companies. We are not exaggerating when we say that this will change the way the mining industry operates.

Can you tell us more about the specific way you provide training and consulting services and how important these components of your business are in Brazil and in Peru?

In Brazil, consulting services make up the bulk of our activity, while the rest comes from training. In Peru, it is more evenly split between training and consulting. We have a lot of space to do more consultancy work in Peru and we expect growth in this area. We also have the potential in Latin America to increase our offering of two specific types of training: professional training with courses for specific disciplines such as geologic statistics or mining planning and operator training, where we will work with specialized companies and experts in the field that can share their experience in matters such as truck driving and operations.

In 2012, you mentioned that the mining industry did not have regulations that were as strict as those in aviation. However, there have been recent developments in mining safety regulations in Peru and other Latin American countries. How have these measures impacted your business?

The mining industry has its own safety regulations and parameters but what it does not have, in Brazil, Peru, or the rest of the world, is a governmental top-down legislation that makes certain standards (for example, a minimum of 100 hours of simulator training for a truck driver) mandatory. The aviation industry is very far ahead with respect to that and what we would like to see in the mining industry is a set of similar clear regulations, especially since safety is considered a main priority by all mining companies. Up until recently, CAE Mining had not benefited from these changes in regulations but we are now starting to witness them in Peru and throughout Latin America, as the market is demanding more

and more simulator products. We launched our first simulator last year and now we see opportunities with our main customers in Peru, Colombia, Chile and Brazil. The synergy with our core civil aviation business really gives CAE Mining the edge in building very realistic simulators that are sought-after within the industry and thus, we are very well positioned in the market to take advantage of this trend.

Given the conservative approach and the reluctance of mining companies to use new technologies, how is CAE Mining managing to educate the market and what is the feedback that you are seeing from your clients?

We are seeing increased interest from mining companies in Peru and in Brazil to invest in new technologies. A few years ago, the deci-

sions on whether or not to adopt our solutions were left to specific engineers or geologists whereas nowadays we are witnessing more corporate, strategic decisions being made by companies as a whole. By properly showing our customers the kind of benefits and savings that we can offer them, CAE Mining has managed to overcome that reluctance and we are gaining more and more acceptance. In periods of cost-cutting, our simulation-based training solutions and our optimization solutions help reduce costs.

What are some of CAE Mining's corporate values and differentiators in the market and what is the vision that you have for your organization regionally, in the future?

Our vision is to be the partner of choice of mining companies. Our optimization, mod-

elling and simulation-based solutions can help them increase productivity, efficiency as well as safety. A unique differentiator that CAE Mining benefits from is the synergies with its core civil aviation business: we are able to draw from 65 years of experience, research and development as well as best practices and adapt them to the mining industry. Furthermore, our global footprint and culture of service add even more value to our organization. Finally, the quality, the experience and the commitment of our employees are key assets. CAE Mining is focusing on very good growth rates for Latin America for the near future. We have added a new office in Medellin, Colombia, which will work closely with our Peru and Chile locations to really have a strong presence in the region. •

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INTERVIEW WITH

Davi Freire

GENERAL MANAGER  
MODULAR MINING SYSTEMS

Modular Mining Systems offers a wide array of services and products that are offered in specific suites. How do you structure these packages in order to add value for your clients? Modular Mining Systems’ suite of products is called IntelliMine, and it is based on four solutions covering different areas; we consider these to be the pillars of our company. First, we have the Mine Operation Management Systems, traditionally known as DISPATCH, a widely used and multi-functional system. Second, our High Precision Operations Systems, called ProVision, offers GPS machine-guidance solutions. Third, we have our Telemetry Systems that are used remotely to efficiently monitor and detect potential problems with heavy equipment, trucks and mobile equipment, all of which are essential in mining operations. Finally, our Mine Alert system is a new brand that we launched last year at MIN-Expo, which focuses on drastically improving the safety conditions of mine operations. Additionally, Modular also offers an array of support, consulting, and benchmarking services that we consider essential to our global growth strategy. These services are grouped however under a different global organization, called Value Add, with head offices in Vancouver, Canada.

How extensive is Modular Mining Systems’ global presence and what is the strategic importance of Brazil for the company as a whole? Modular Mining Systems is a global leader in its sector of the market, with over 240 clients worldwide: in North America, Africa, Australia, and in Latin America. Our products, such as the Mine Management Systems, are used as industry-wide benchmarks and their functionality is incomparably better than that of any other product system on the market. We have received tremendous feedback from our clients, testimonies of how Modular solutions

have helped increase productivity and safety levels. Modular Brazil is doing very well and 2012 was an exceptional year for us as we experienced a 55% growth rate. At a global level, the company grew by approximately 30%.

What were the main drivers behind Modular Mining Systems’ impressive growth rate in Brazil last year?

Our 2012 grow rate was stimulated by the new safety-related products that we launched. One of them, called FatigueAlert, is very important as it constitutes a fatigue management solution that has great applicability all over the world, preventing accidents from happening and thus greatly reducing costs for our clients. Another essential product Modular designed is called Fast Feedback; this allows mine workers, such as truck drivers, to receive live feedback concerning their performance on the job. Fast Feedback has a dual application, as it prevents accidents and abusive use of machinery while performing training on the job. This feature is immensely important in Africa and Latin America, where labor demand is very high and where training time is greatly reduced.

How much does Modular Mining Systems help its clients save on a project?

Modular Mining Systems can help its clients save substantially on their projects. Vale’s Carajas Mine realized cost reductions of around 64% in 2011 and 30% in 2012 on corrective maintenance (such as spare parts and labor costs) by using the MineCare telemetry system integrated to other Modular solutions. This was achieved thanks to Modular’s Mine Care solutions that are designed to allow mines to have predictive maintenance; consequently, maintenance engineers can correct failures before they actually happen: this, in turn, keeps the mine working at full capacity,

eliminating non-productive idle time. Furthermore, Mine Care’s predictive nature keeps utility engines from malfunctioning and thus we manage to offer extended life to these extremely expensive components that can cost up to \$500,000 apiece. Another revolutionary solution from Modular Mining Systems that improves safety for operators is called Fast Feedback and this application automatically sends a message to the operator once a defect or mistake is detected on his operation; the efficiency of this system is dictated by the fact that it takes into account direct system alerts and it doesn’t depend on tasks performed by people. Vale’s Carajas complex, as well as many other mines are using this already.

What are some of the trends that Modular Mining Systems sees within the Brazilian mining market and how do these affect your operations?

The mining industry in Brazil is becoming more sophisticated and more mature. We are seeing companies coming to us looking to improve and optimize their mining operations. Nowadays, even small companies can fully benefit from our range of products as Modular’s solutions, such as ProVision, have stand-alone capacity; they can be integrated smoothly and efficiently into other fleet control systems. Currently, Brazilian mining is seeing a new trend that has to do with the local regulatory framework; because it is so difficult to obtain environmental licensing, the optimization and the improvement of existing mining projects is becoming prevalent. As global demand grows, Modular Mining Systems Brazil welcomes this trend as our array of products is aimed specifically at increasing the productivity levels of mines. •

Minas Gerais

Fertile land for local innovation

Situated in the southeast of the country, just above São Paulo and Rio de Janeiro, the state of Minas Gerais has emerged as one of the country’s most important economic engines, and the primary driver of its mineral industry. It has, over the centuries, played host to several generations of miners, from the Portuguese pioneers in the 1600s, to the English gold prospectors 200 years later, to the rather more sophisticated international crowd that calls the area home today. In the state capital of Belo Horizonte it is possible to find all of the services necessary to develop a mine from initial exploration through to production as well as a wealth of high quality educational establishments preparing the next generation of geologists and engineers. In some instances, the physical conditions of working in the state have led to a tangible effect on how a company is formed. “We developed around the explosion in production of iron ore in the region, and as this is such a tough material to deal with it has necessarily made our products stronger than those of our competitors. This in turn has driven mining companies in distant states to turn to us rather than to local producers because they know that our buckets and bodies are sufficiently robust to put up with the harshest of conditions,” said company director, Leonardo Parreiras of specialist truck body constructor Inmecco. —> 75




Minas Gerais at a Glance

Source: Various

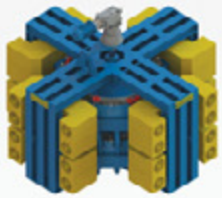
**Population:** 19,855,332 (2012)  
**Capital:** Belo Horizonte  
**Governor:** Antônio Anastasia (PSDB)  
**GDP:** \$121,779 million (2009)  
**GDP per capita:** \$6,029.76 (2009)  
**Economic Sector Breakdown:** agriculture: 9%, industry: 30%, services: 61%  
**Exports:** 41,392,937 (2011); iron ore, coffee, mineral products  
**Imports:** 13,026,096 (2011)  
**Major Trade Partners:** China, USA, Argentina, Germany, Japan




Wet High Intensity Magnetic Separation





**World's Largest  
GHX - 1400 | 1400 TPH  
2013**



**GX - 800 | 800 TPH  
2010**

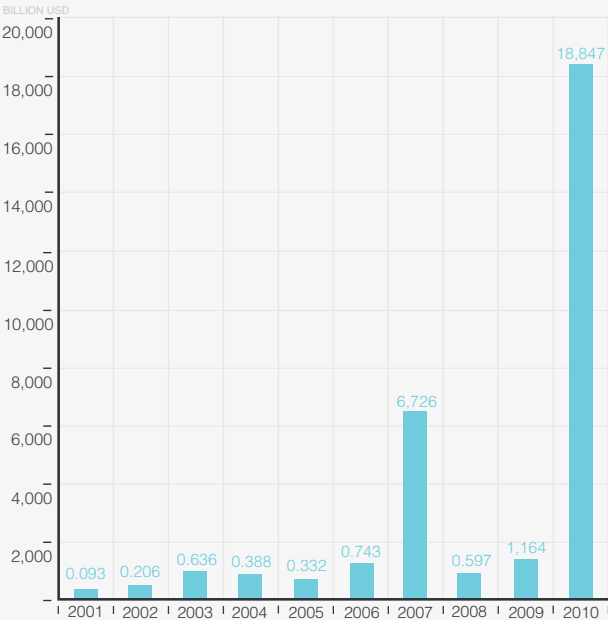


**GHP - 400 | 400 TPH  
2003**



FDI into Minas Gerais

Source: INDI / ACMinas Economic Department



FDI into Minas Gerais by Sector

Source: INDI / ACMinas Economic Department

SECTORS	TOTAL 2001 - 2010 (USD)	GROWTH %
Mining	34.0%	49.69%
Steel Industry	14 774 328 713	24.74%
Automotive	7 355 397 188	14.16%
Chemical	4 209 305 857	3.20%
Services	951 466 520	2.47%
Non - Metallic	735 238 478	1.46%
Energy	362 787 040	1.22%
Agribusiness	207 823 936	0.70%
Metallurgy	198 574 898	0.67%
Electronics	161 589 943	0.54%
Mechanical	145 882 535	0.49%
Textile	76 684 311	0.26%
Furniture	75 022 686	0.25%
Footwear and Leather	35 860 333	0.12%
Electrical	10 250 758	0.03%
Total	29 733 158 086	100.00%

73 Another local manufacturer with a basis in iron ore is that of Gaustec, the Belo Horizonte based producer of Wet High Intensity Magnetic Separators (WHIMS). Over the last 10 years, the company has evolved from a father-and-son team designing their products in an improvised laboratory, into an international equipment supplier with 50% of domestic market share, whose clients include all the major Brazilian producers, as well as mines in India, Venezuela and Australia. Whilst many companies involved in processing iron ore are feeling the negative impact of China's economic slowdown, Gaustec is turning the situation into an opportunity: as several new iron ore projects around the world are being scaled back, many producers are seeking to optimize the processing plants in their existing projects and are turning to Gaustec's separators to recover ever-lower grades of ore. "In the past, producers were reluctant to look at anything that was below 30%, but we are now seeing them considering processing tailings with as little as 6% ore," said founder and director, José Pancrácio Ribeiro.



Two of the most frequently voiced complaints about Brazil are that it suffers from a severe shortage of skilled labor, and that the infrastructure is ill-suited to support heavy industry. The fact that mining exploration often takes place in particularly remote areas of the country means that it feels the effects of these problems even more keenly than most industries. Drill manufacturer Trado was founded in 1978 with the express goal of designing lightweight, easy to use pieces of equipment that it would be possible to transport to the most remote locations in the country. "To date, we have sold over 1,000 rigs around the world and still keep to our original philosophy that Trado drills should be mobile enough to be transported by a small helicopter, pick-ups or even on a horse to reach the most remote locations in the world," said director president Alexandre Guimarães Misk. Although the rigs were originally developed with the Brazilian customer in mind, they have found a market in far-flung locations across the globe such as Democratic Republic of the Congo and Laos that suffer from the same logistical issues as Brazil. In doing so, they are continuing the development and enhancing the reputation of Mias Gerais as a hub for services and innovation. •

Total Announced Investments

Source: INDI / ACMinas Economic Department


SECTOR	VOLUME ( '000 USD )	%	JOBS CREATED	%	PROJECTS	%
Agribusiness	1 438 082.62	6.59	13 983	27.96	31	15.58
Automotive	69 163.89	0.32	632	1.26	4	2.01
Shoes and Leather	12 582.57	0.06	1000	2.00	1	0.50
Trade	25 228.06	0.12	532	1.06	5	2.51
Education	1 447	0.01	0	0	2	1.01
Electric	342 466.18	1.57	1 592	3.18	8	4.02
Electronics	52 664.67	0.24	933	1.87	25	12.56
Energy	673 192.83	3.08	365	0.73	10	5.03
Gas	1 405 185.91	6.44	0	0	3	1.51
Infrastructure	437 760.30	2.01	58	0.12	6	3.02
Mechanical	439 903.58	2.02	3 776	7.55	12	6.03
Metallurgy	161 820.54	0.74	1 431	2.86	7	3.52
Mining	8 068 624.72	36.97	3 515	7.03	7	3.52
Furniture	520 918.53	2.39	500	1.00	1	0.50
Non - Metals	225 203.52	1.03	869	1.74	4	2.01
R&D	14 029.57	0.06	0	0	2	1.01
Chemical	5 384 647.49	24.67	11 423	22.84	42	21.11
Health	108 732.31	0.50	0	0	8	4.02
Security	943.69	0.00	150	0.30	1	0.50
Services	546 270.86	2.50	6 066	12.13	10	5.03
Steel	1 484 743.63	6.80	0	0	1	0.50
Textile	169 367.73	0.78	2 990	5.98	6	3.02
Air Transport	243 913.18	1.12	200	0.40	3	1.51
Total	21 826 893.37	100.00	50 015	100.00	199	100.00

# INMECO Dump Truck Bodies



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INTERVIEW WITH

# Leonardo Parreiras

DIRECTOR  
INMECO

Could you give us an introduction to Inmecco's history, its main achievements and your own involvement in the company?

Inmecco was founded in 2001 in Belo Horizonte by a local family, and was originally an operation to produce components for other truck companies. Since that time the Brazilian mining industry has grown enormously, and so has Inmecco. In 2005 we began designing and manufacturing our own buckets; this started with just one product, a lightweight body that was more geared towards civil construction and the transport of aggregates like building sand. My family entered the company in 2008, buying up a large portion of shares, and I took over the operation in 2010, at which point we acquired 100% control of Inmecco. From this point on we started to focus on innovation and began to expand our portfolio, adding several new products such as half-pipe buckets, which are much more suited to the mining operations that we see in the region. Ever since, we have been bringing more technology to our development and processing facilities in order to improve our products and increase our market share. Recently, Inmecco has invested strongly in several new machines such as presses, and cutting and welding tools, and we have also doubled the size of our production facility since 2010. The end result of this expansion is that we now have capacity to produce approximately 1,000 buckets per year, although we currently only produce about half this quantity.

As a relatively new entrant in a sector that had several established players, how receptive has the market been to Inmecco's products?

Overall the reception of our products has been good. Our biggest challenge here is the development of a new brand. Competitors are well established in the region and it is sometimes difficult to persuade clients who have a

long-standing relationship with one supplier to suddenly switch. This said, we are making progress, but the country's poor economic condition has certainly not helped. In spite of these setbacks, we have been growing well; we now have activities throughout Brazil, and have just exported a number of products to a Brazilian company in Africa. In the future we hope to expand more internationally, but it is not our main priority as there is still plenty of space to grow in the domestic market. We are situated right in the middle of the Iron Ore Quadrilateral and are surrounded by mines whose appetite for equipment keeps on growing.

What would you say are the main differentials that set Inmecco apart from other truck body producers in Brazil?

The main advantage that we have over our competitors is the capacity to understand client's needs and provide them a proper solution for their particular applications. We have been increasing our investments in engineering and product development over the last years: in 2012 we started a new design for a half-pipe bucket with an innovative armless rear flap mechanism, and high-resistant steel plates, in order to reduce the equipment weight and also to improve equipment's safety. The first equipment was recently delivered to a truck manufacturer with whom we collaborate in development and testing new products. As some of our customers use their trucks not only for in-mine operations, but also for road freight transportation, we developed a new line of high-performance light bodies to 8x2 trucks that enable them to increase the payload in 6,000 kg compared to the old 6x2 models.

We use high quality materials, some imported from Europe, aiming to maximize transport capacity, minimize fuel consumption, and

contribute to a significant overall cost reduction for our customers. Aside from the products themselves, we also offer very fast delivery and installation times to our clients; we usually ask for 20 days to offer a full installation, but it is not uncommon to be finished in a week if we have sufficient advance warning. We also have a dedicated maintenance team who we dispatch to clients as soon as we hear of a problem in one of our machines. In states outside of Minas Gerais we have agreements with other mechanic firms, but if they are unavailable for any reason then we do not hesitate to put one of our technicians on a plane in order to minimize our clients' downtime. We are still not the biggest company in our sector, but we are sure that our products are the best in the market.

Given Brazil's vast natural resources in several sectors, such as mining and agriculture, what do you see as being the main drivers of growth for your industry?

Speaking on a national level, probably the most important driver for growth in the industry this year has been Brazil's booming agricultural sector, which has helped many companies involved in the trucking business. We have actually not felt the effects of this boom in Minas Gerais as there is very little farming in the region. What we have felt has been the growth of the mining industry, although this has faltered somewhat in the last year. Inmecco developed around the explosion in production of iron ore and as this is such a physically tough material to deal with, it has necessarily made our products stronger than those of our competitors. This in turn has driven mining companies in distant states to turn to us rather than to local producers because they know that our buckets and bodies are sufficiently robust to put up with the harshest of conditions. •



INTERVIEW WITH

# Alexandre Guimarães Misk

CHIEF EXECUTIVE OFFICER  
TRADO

Research and development is obviously an integral part of staying ahead in any manufacturing business. What is the role of R&D within Trado?

We are constantly striving to stay one step ahead of the competition. In a competitive market such as the mining industry it is extremely important to know exactly what a client needs so we maintain a close relationship with all our clients and listen to the feedback they give us about our products. An example of this is when Alcoa first came to Belo Horizonte looking to acquire some drills to conduct exploratory operations in northern Brazil. The first drills we sold to them were not sufficiently robust to deal with the tough terrain in that environment, so we worked closely with them to improve the design, technology and materials used in our products. Then we perfected the formula to an even better product. Now, our challenge is to comply our product with the most restrict safety regulations such as the one used in EU.

How has the DNPM's hold on exploration permits affected Trado in the past year and what effect do you believe the effect of the new mining code will have on the industry?

Although the DNPM's hold on exploration permits has caused serious problems for many of our clients over the last year, Trado had not been directly affected until very recently. Most of our clients had several areas earmarked for development for which they already had the necessary permits, but unfortunately these are now starting to run out. Until March we were experiencing a very positive year, with growth to match our defined goals, but now we are certainly starting to feel the impact of the hold. Although demand has not fallen, it is not increasing at the rate we were hoping for. The prospect of the new mining code is making us all in the industry very nervous, as we simply do not know what to expect from it. Hopefully, once it is released it will restore some confidence in the market and we will see new investment coming into the sector once again.

Could you describe the main differences that exist between the technology used for Trado drills and conventional drilling methods?

The three most important words that best describe our drills are cheap, light, and effective. Compared to a standard drill rig we offer significantly lower operation costs and the initial outlay for one of our machines is approximately 10 times less that is required for a larger drill. In addition to this, our rigs are incredibly simple to use so it is not necessary to have a team of highly trained

technicians in order to carry out an operation; we are confident that our clients will be able to use locally sourced unskilled labor to work our drills anywhere in the world. Another advantage we have over the competition is the high quality of our products, our short lead time and our flexibility to develop products suitable to client's needs. It is thanks to all of these reasons that we have managed to achieve additional share of the market year after year. At last, but not least, the portable equipment's size allows access to exploration site with no vegetation suppress minimizing the ecological footprint. Also, its dry drilling process prevents environmental damage by oil or any other chemical products. It prevents the necessity of any licenses or other bureaucratic processes regarding to environment issues. •

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## INTERVIEW WITH

# João Ronchel

HEAD OF GLOBAL MINING AND METALS  
PÖYRY



Could you explain how Pöyry's presence in Brazil has evolved during the 40 years since its establishment, detailing how the different business cycles have affected your involvement in the mining industry?

Pöyry is a publicly traded Finnish company based in Helsinki. We were established in Brazil more than 40 years ago, designing and building the first Brazilian pulp plant in 1969, in Guaíba, which we are currently expanding. Although our core business is in pulp and paper, during the Brazilian economic miracle of the 1970s, we expanded into the automotive, chemicals, oil and gas, and mining and metals industries. We experienced rapid growth during the 1970s and 1980s, solidifying our local reputation in engineering and covering the entire life cycle of projects, from conception and design through execution. By the 1980s, we were the second largest engineering company, with 4,000 employees working in Brazil. We teamed up with a local partner, who owned 60% of our shares. In the late 1990s, our shareholders decided to split the firm. We maintained our focus on pulp and paper, and we got in 2001 an important contract with Alcoa in Poços de Caldas. Pöyry continued to grow based on the pulp plants we had built, and we have been riding this wave since 2001. We have designed and built more than seven plants in the pulp industry in the last ten years, both greenfield and brownfield. In the mids 2000s we decided to diversify, appointing a new Latin American CEO in 2008 and hiring specialists to prepare value propositions for the mining industry. I joined the company in early 2011, and my first initiative was to open an office in Belo Horizonte, which has become our mining headquarters. Today, we employ 1,000 people in Brazil, with 200 of our engineers working on-site on 'capital expenditure sustaining projects.' In the mining sector we work in both traditional projects,

including greenfield and brownfield, as well as in small to medium-sized capital expenditure sustaining projects, which yield between USD \$10,000 and \$1,000,000.

Who are the main clients that you work with in Brazil, and how closely do you work with junior exploration companies?

We work with all the major players in the Brazilian mining industry. We are conducting all the engineering and commissioning for CSN's highest priority project, which is the duplication of its iron ore production from 20 million tonnes to 40 million. Our other clients include Magnesita, Gerdau, Alcoa, Votorantim Metais and Yamana Gold Inc. In Brazil, it is important to have a diversified client base, because as we saw recently with some customers, they can halt their projects from one day to the next. The exploration business in Brazil is not as highly developed as in Canada, Peru or Chile. Most of the junior companies in Brazil are foreign, in particular Canadian, or small/medium enterprises and we do not have the exploration market as developed as in Canada or Australia where junior companies are raising money on the stock exchange. Large player such as Votorantim Metais wait for junior companies to do the early stage exploration, taking over their exploration in the later stages. However, the iron ore business is a completely different game, with Vale dominating the market, holding over 80% of the business. And we believe that junior exploration companies are the key to developing a profitable exploration market.

Could you provide us with an overview of Pöyry's key services and how you provide added value to clients in the Brazilian market?

Pöyry has more than 40 years of experience in the market, and all of our executives are Brazilian, so we know how to handle the ups

and downs of the market. Most importantly, Pöyry adopts a holistic view of project implementation, managing all the potential roadblocks that could occur during the project life and recommending integral solutions for our clients. Pöyry is one of the few companies in the industry that also has a management consulting division, which allows us to conduct market and logistics studies. We deliver value all the way through the project life. We start by optimizing the mining operation, which includes predominately logistics, and then we take care of the beneficiation plans. Brazil used to have very high quality deposits, in particular in iron ore, which were easy to extract and did not require beneficiation processes. However, as the reserves are dwindling, beneficiation processes have become essential. Our goal is to work together with laboratories to analyze the type of mineral, and on the basis of the mineral characterization, we develop solutions for our clients, advising on the best plant size and the ideal timing.

What do you believe will be the effects of the new mining code on the Brazilian mining industry and on future investments in both iron ore and other minerals and metals?

On the exploration side, the new mining code using auction system will encourage companies to develop more detailed investment plans, which will help make the Brazilian mining industry more professional. However, companies will need to pay for a concession, so the industry will become more expensive. On the mining side, the doubling of the royalties is likely to make Brazil lose competitiveness. The royalty will vary across different minerals. Up to now there is no final decision about those percentages, but there is no doubt that iron ore will have the highest royalties. Other industries are likely to be incentivized, such as potash for the fertilizer industry. In the

last five to eight years, USD \$15-20 billion has been invested annually in the mining industry, and there is a big chance that the new mining code will discourage future investments. Brazil will likely maintain the same levels of investment in iron ore that it has received in recent years. However, on the metals side, our competitiveness is declining due to the high cost of energy and labor, as well as our low productivity. In gold and bauxite, there are still some opportunities, but in nickel or aluminum there are few opportunities left. Overall, Brazil's mining industry is not performing as well as it has in the past—in particular in terms of meeting deadlines and minimizing investment costs—and the main reason for this is the failure to adopt a holistic perspective on project implementation. According to a recent study conduct by our company, Mining projects in Brazil have been

spent 70%, in average, above from its initial investment estimate. The main problem is the fragmentation of the services in Brazil, with companies failing to adopt a systematic view of project implementation. There needs to be a lot more planning, working beforehand with the communities, preparing feed engineering, and taking into consideration all the aspects of project implementation. Pöyry adopts a holistic view, integrating every specialist that we hire into the entire system, and delivering on time and on budget. In fact, our deviation in the pulp industry is only 3%, and we have a record of finishing our projects on average 20 days in advance. Our project management office (PMO) works directly with the customer to develop contingency planning for potential economic or political risks to the project, for example, the risk of a strike disrupting operations.

What is your vision for the future of Pöyry?

Pöyry sees great potential for growth in the mining industry, both in Brazil and globally, and our target is to quadruple our mining and metals division. Diversifying globally will be important to solidifying our relationships with clients all around the world. Most of our competitors are currently reducing investments and pacing down their offices, but we are hiring two to three employees per week in Belo Horizonte. Our strategy is to continue to grow and add more value to the projects, delivering sustainable solutions for clients around the world. •

**PÖYRY**  
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[www.poyry.com.br](http://www.poyry.com.br)





INTERVIEW WITH

# Cauê Pauli de Araújo

INTERIM GENERAL MANAGER  
SRK BRAZIL

Could you bring us up to date with an overview of the main milestones for SRK Brazil over the last year?

Last year our strategy was negatively impacted by the rising levels of uncertainty around the New Mining Code, and the very real hold on exploration permits introduced by DNPM. As a result of this, many important contracts were either postponed or put on hold for an undetermined period of time. As this issue now seems to be nearing resolution, we are gearing up again to meet the needs of our clients.

SRK offers a wide range of services to its clients. What are the main services you provide to the Brazilian market?

The Brazilian office for SRK is currently very strong on exploration and mining services, with a secondary focus on environmental work. This said,

we are part of a global company with over 1,500 personnel distributed around 50 offices worldwide and we are able to draw on their expertise and bring over specialist consultants as and when a project needs them. This arrangement is reciprocal, and some of our staff are occasionally required to travel and work in other countries. In Brazil, we are currently considering offering other services, such as high level geotechnical consulting, which is SRK's original focus, and we are also hoping to work more with banks and foreign investors, carrying out due diligence on acquisitions.

Could you give us an idea of some of your main clients in Brazil, and outline some of the major projects you are involved with?

Internationally, many of our clients are the international mining giants with whom we collaborate on a wide range of projects across various different countries. Focusing specifically on Brazil, we work with both majors and junior companies. We have contracts with Usiminas and CSN to carry out mine planning services, and right now we are working on exploration due diligence for several Asian investors who are looking to acquire projects here. Generally speaking, we are seeing more foreign than domestic interest in the sector, with a particularly strong participation from Canadian exploration companies who are focusing mainly on precious metals exploration projects. Although Brazil is traditionally an iron ore country, it is interesting to note that precious metals are becoming more and more popular here.

Several industry experts have noted a shift towards more underground mining in Brazil in the near future. How do you view this trend?

It is true that there is a shift towards more underground projects, mainly due to the significant increase in commodity prices during the last decade. We know some companies are starting to consider this option, but we are not sure if there will be a particularly substantial movement or if these players are simply evaluating their potential. There is undoubtedly a future for more underground mining in Brazil, but the country will probably continue to be concentrated on open-pit extraction, at least in the medium term. Many open-pit mines here have not made yet the use of the most cutting edge exploration and operational techniques. Therefore, these operations could be able to improve efficiencies and extend the mine life before going underground. •



INTERVIEW WITH

# Paulo Libanio

GENERAL MANAGER  
AUSENCO BRAZIL

Could you give us an update on how Ausenco Brazil has developed since we last met in 2011? How important is Brazil to Ausenco's global operations?

Since 2011 Ausenco Brazil has expanded considerably on several fronts: our headcount has increased from approximately 150 to 280, our market share has grown, although this is more difficult to measure exactly, and our revenues are up by some 40%. Over this time period we have also consolidated all the different arms of our business into one office in Belo Horizonte. Today, all of Ausenco's employees in Brazil work under one roof and this has made a real impact on productivity and boosted the potential for synergies to be created between the different areas we operate in.

Brazil is a very important market for Ausenco: it is impossible to ignore the enormous potential that the country demonstrates in terms of mining and all the associated transport and energy infrastructure needed for a successful mining sector. At a global level we are trying to achieve greater geographical dispersion so the company is not overly focused on one area, and does not suffer too much if the economy in a given region slows down.

Can you tell us about Ausenco's involvement in the Samarco P4P project?

We have a long-standing relationship with Samarco and they are excellent clients to work with. For the P4P pelletization plant we are not actually involved on the plant itself, but rather with the pipeline that will carry the ore 420km from the mine site in Mariana, Minas Gerais all the way to the plant on the coast of Espírito Santo. In the 1970s Samarco built the world's first mineral slurry pipeline, which was designed by the American firm Bechtel Engineering, and the team that designed this pipeline then formed their own specialist pipeline company, PSI. As of 2008 Ausenco

owns PSI and the experts from this team are now our employees. As such, we have engineers working for us who have collaborated with Samarco on all their pipeline projects since the 1970s and have a deep understanding of what is needed to develop a successful project.

What is your evaluation of the role of Pará in the Brazilian mining sector?

Pará is already very important to the sector with several very important projects currently being developed in the state, and I am certain that it will eventually overtake Minas Gerais as the main contributor to the country's mining economy. However, as its stands very few companies have their HQ located in Pará. Whilst some of the country's biggest producers have operations already in place in the region, the majority of the engineering and design work for these projects takes place in the south, i.e. Belo Horizonte. All the major service providers are based here, as well as the highest quality lab facilities in the country and the best engineering universities so it seems likely that Minas Gerais will remain dominant, at least in terms of being the country's knowledge center, for many years to come.

As iron ore grades get lower have you seen increased demand for additional beneficiation plants?

This progression towards mining ever lower grades of ore is simply the natural course the industry must follow. Here in Belo Horizonte it used to be common to find very rich hematite deposits with grades of 65%, and the only processing required was simple crushing and screening. Now, with very few exceptions, all the mines here are itabirite deposits and 35% is considered a decent grade to be working with. This has led to a need for more complex beneficiation processes and an

increased demand for technological solutions to reclaiming every iron ore particle from tailings. This technology is going to play a key role in the development of future mines and for brownfield expansion of existing operations as producers seek to become more efficient and eliminate waste.

To what extent does Ausenco usually work in partnership with other engineering firms?

There are several strong engineering firms working in Brazil, both domestic and international, but very few of the national companies have the necessary expertise to oversee and lead a full mining project. We often work in partnership with other companies, particularly in the case of major projects where there is a need for mine planning and geological mapping, which is not our specialty. There is definitely space in the market for different companies to work together. Ideally when working on a significant project, the aim should be to take advantage of the key expertise offered by each player in order to achieve the best possible results, and in this respect we are very open to collaborations. •



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# Into the Future: Final Thoughts, Company Guide, and Index

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"Around the world we have never encountered a company who started using Ground Probe solutions then decided to abandon them. As such, we are confident that our business is going to be hugely successful in Brazil, and we aim to grow by over 100% for the next five years. Having evolved from being a technology company to an information-based company, we are now looking to become a knowledge management company."

- David Ogan,  
General Manager Americas, GROUNDPROBE



Courtesy of Votorantim



"The industry has been suffering for a few years now because of the uncertainty over the new Mining Code, and now that it has finally arrived we hope to see a new wave of investment hit the sector, which will translate into more demand for our products. With regards to the new infrastructure, although it may seem counterintuitive, we hope to see concrete developments in railway and port construction because it will open up new areas for mining that were previously unviable, and this will help the whole industry to grow, including Inmeco. There will always be a place for trucks and a place for the high-quality equipment that we can offer and, as such, we are confident of our prospects for the future. Caterpillar had better watch out!"

- Leonardo Parreiras, Director, INMECO

"We have nearly 40 years of experience in the industry and a reputation for being serious, trustworthy, and operating with complete transparency in all our negotiations. We hopefully expect to double our operations until 2015 relying on two exciting product projects. The first one is an improvement of our drill that complies with the most restrict safety and health at work regulation on the world. The second one is a more sophisticated drill with hydraulic power that will be able to reach deeper depths, operated by no more than two people and also keeping almost the same mobility of our current drill."

- Alexandre Guimarães Misk, Chief Executive Officer, Trado

"Brazilian mining is a young industry, as modern mining in Brazil does not really go back much before 1970. By the early 1970s other mining jurisdictions around the world had already worked out most of the environmental regulations they needed to impose on the industry. Without this head start, and partly because of the garimpeiros laws, which enable artisanal miners in Brazil to pursue mining on an individual basis, there is a definite lack of understanding toward the importance of the environment in small companies operating in Brazil. RungePincockMinarco sees this all the time. We encourage companies to go for permit applications as soon as they think they have a deposit, because often they ignore the issue and it later sets them back by years. Some assume permitting will only take a couple of months, but this is not the case in Brazil, where regulations are tightening up."

- Barton Stone, Director, RungePincockMinarco

"Energold's future in Brazil will be a good one once the communications between the government and the mining industry will be resolved. Of course, the content of the new mining code is a determinant factor and the government needs to listen to the businesses in the industry, and accept their invaluable technical expertise and input. Last year, Brazil lost \$70 billion of foreign exploration investments because of its bureaucracy. Issues such as the plan for increased royalties must be managed carefully, while others, such as the auction system, should be denied implementation because of their detrimental nature; the mining sector should have a more determinant voice in the creation of the laws that will govern it. Energold's future will depend on these variables but I believe that the market will really boom for us here in Brazil in the end, since this country holds such tremendous potential."

- Paulo Almeida, Operations Manager, Energold



"Colossus Minerals will be using its Serra Pelada project as an engine for growth for potential future expansions in Brazil, where we are also working on developing other projects. As we have already gained expertise and experience in the country, it makes economic sense for us to keep developing here and maximizing the opportunities that Brazil can offer us; in the future, Colossus might also consider moving to other Latin American countries but Brazil will remain our biggest focus."

- Claudio Mancuso, Director and CEO, Colossus Minerals

"Speaking frankly, we do not see the new code in a very positive light. Looking first at the changes to the royalty system, the proposed increases are supposed to bring the country into line with other jurisdictions such as Mexico and Australia where they have very high rates. However, this is misleading because here in Brazil companies must pay significantly higher rates for all other taxes so unless the government provides compensatory measures across other taxes then most mines will be affected negatively. The transition to an auction based concessions system has the potential to be very damaging for the country because it will deter junior companies from investing in Brazil, and without the juniors nobody is willing to take any risks and develop new projects. What the country really needs is more foreign investment, a greater level of openness and more discoveries being made, but the code seems set on achieving the opposite. Nevertheless, with regards to Forbes and Manhattan, we are very optimistic about the future as the projects we currently have on the books will not be affected by any of the new legislation and we are confident that they will bring us significant return in the future."

- Helio Diniz, Vice President Brazil Operations, Forbes and Manhattan

"Over the course of the last year, SGS grew 20% organically and 40% by M&A, so in terms of rate of expansion, SGS is doing very well in Brazil. However, we do not plan to stop here; right now, we are still in the top 20 operations worldwide for the company, but we are targeting a position that properly reflects the size of the Brazilian market so if we analyze the situation from that perspective, we need to be at least in the top 10. The main markets that we are focusing on right now are the industrial ones, which are still very hot for us and in which we have invested considerably since they are poised to keep growing over the next four years."

- Marcelo Stenzel, Managing Director, SGS Brazil

"The vast majority of mining projects in Brazil are still open pit, but it is true that we are starting to see the beginnings of a shift towards underground operations. It is easy to see why the industry is moving in this direction; taking iron ore as an example, it is not uncommon for a major producer to leave behind up to 100 Mt of high-grade hematite ore, which can only be accessed through underground extraction methods. Admittedly, such projects require very high initial expenditure to start running, but with good logistics and simple processing options they can become viable projects. We are not looking at the prospect of a sudden boom in underground mining in the near future, but there is potential for this to be very important in the long term so it is necessary to understand the challenges involved so as to be prepared for the shift. At the moment there is a distinct lack of expertise in underground mining methods in Brazil, so today we are drawing on the experience of Snowden's personnel from other countries and sending our staff to complete specialist training in Chile where they have a much longer relationship with these techniques."

- Fabiano Araujo, Country Manager Brazil, Snowden

COMPANY NAME	WEBSITE	PAGE	COMPANY NAME	WEBSITE	PAGE
Government, Associations and Organizations			Engineering and Consulting		
Agency for the Technological Development of the Brazilian Mining Industry	www.adimb.com.br		HGC Tecnologia	www.hgctecnologia.com.br	
Aluminum Association of Brazil (ABAL)	www.abal.org.br		Kuttner	www.kuttner.com.br	
Brazilian Mining Association (IBRAM)	www.ibram.org.br	14, 20, 24, 35, 61	Montcalm	www.montcalm.com.br	
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Ministry of Mines and Energy	www.mme.gov.br		Skanska	www.la.skanska.com	
Mineral Explorers and Producers			SNC Lavalin	www.snclavalin.com	
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Brazilian Mineral Production 2011

SOURCE: USGS

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2007	2008	2009	2010	2011 <sup>P</sup>
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	25,460,700	28,097,500	26,074,400 <sup>r</sup>	32,028,000 <sup>r</sup>	34,494,200
Alumina	7,077,600	7,822,300	8,617,900 <sup>r</sup>	9,433,400 <sup>r</sup>	10,182,200
Metal:					
Primary	1,655,000	1,661,100	1,535,000 <sup>r</sup>	1,536,100 <sup>r</sup>	1,440,400
Secondary	255,000	256,000	250,000	252,000	248,700
Total	1,910,000	1,917,100	1,785,000 <sup>r</sup>	1,788,100 <sup>r</sup>	1,689,100
Cadmium, metal, primary <sup>e</sup>	200	200	200	200	200
Chromium:					
Crude ore	627,772	664,347 <sup>r</sup>	365,210	520,129	528,450
Concentrate and lump, Cr <sub>2</sub> O <sub>3</sub> content	253,254	256,300	246,900	258,308	258,300
Marketable product <sup>e,3</sup>	12,000	12,000	12,000	12,000	12,000
Cobalt: <sup>4,5</sup>					
Mine output	2,725 <sup>r</sup>	2,631 <sup>r</sup>	2,075 <sup>r</sup>	3,139 <sup>r</sup>	3,140
Metal	1,311 <sup>r</sup>	1,215 <sup>r</sup>	1,012 <sup>r</sup>	1,369 <sup>r</sup>	1,400
Copper:					
Mine output, Cu content	205,728	218,295	211,692	213,548	218,670
Metal, refined:					
Electrowon	900	3,800	6,500	7,400	7,500
Primary	178,380	191,008	193,899	187,944 <sup>r</sup>	177,800
Secondary <sup>e</sup>	40,000	39,000	31,000	28,948 <sup>r</sup>	47,700
Total	219,280	233,808	231,399	224,292 <sup>r</sup>	232,900
Gold:					
Mine output kilograms	44,443	46,066	52,207	55,592	53,980
Garimpeiros, independent miners do.	5,170	8,600	8,123	6,455	6,270
Total do.	49,613	54,666	60,330	62,047	60,250
Iron and steel:					
Iron ore and concentrate, marketable product: <sup>6</sup>					
Gross weight thousand metric tons	354,674	350,707	298,528	372,120	391,098
Fe content do.	235,504	233,514	198,771	247,772	260,408
Metal:					
Pig iron do.	35,571	35,000	35,000	32,000	33,538
Ferroalloys, electric arc furnace:					
Ferrochromium	195,890	199,324	131,048	277,114	277,100
Ferrochromium silicon	11,600 <sup>e</sup>	11,507	1,500	1,500	1,500
Ferromanganese	419,230 <sup>r</sup>	388,000	154,000	210,000	212,000
Ferronickel	9,918	7,136	9,427	8,465	8,500
Ferronobium	52,442	53,839	34,746	52,588	52,600
Ferrosilicon	146,000 <sup>e</sup>	144,832	145,000	145,000	145,000
Ferrosilicon magnesium <sup>e</sup>	14,600	14,560	14,500	14,500	14,500
Inoculant <sup>e</sup>	11,100	11,100	11,000	11,000	11,000
Silicomanganese	180,000 <sup>e</sup>	178,560	178,600	178,600	178,600
Silicon metal	133,000 <sup>e</sup>	131,940	132,000	132,000	132,000
Other ferroalloys	19,500 <sup>e</sup>	19,344	19,300	19,300	19,300
Total <sup>e</sup>	1,190,000	1,160,142 <sup>5</sup>	831,121 <sup>5</sup>	1,050,067 <sup>5</sup>	1,052,100 <sup>5</sup>
Crude steel, excluding castings thousand metric tons	34,782	33,700	26,500	33,033	35,200
Semimanufactures, flat and nonflat <sup>e</sup> do.	17,500	17,500	17,500	17,500	17,500
Lead:					
Mine output, Pb content in concentrate	24,574	25,286	15,890	19,650	19,700
Metal, secondary	130,963	95,704	104,160	114,887	114,900
Manganese:					
Ore and concentrate, marketable: <sup>3</sup>					
Gross weight	1,570,000	3,200,000	2,320,000	2,620,000	3,222,600
Metal content	520,000	1,280,000	928,000	1,048,000	1,289,040
Metal:					
Primary	22,140	20,910	19,580 <sup>e</sup>	19,580	19,580
Secondary <sup>e</sup>	1,600	1,600	1,520	1,710	1,710

See footnotes at end of table.

Commodity <sup>2</sup>	2007	2008	2009	2010	2011 <sup>P</sup>
METALS—Continued					
Nickel:					
Mine output, ore	5,927,554	6,380,055	4,333,069	11,128,385	11,330,000
Ni content in ore	58,317	67,116	41,059	108,983	110,960
Ni content in carbonate	20,796	18,580	16,766	30,161	30,710
Ni content in matte	3,401	8,328	8,518	14,308	14,570
Ni, electrolytic	21,635	18,530	16,598	19,111	19,500
Ferronickel, Ni content	9,918	7,136	9,427	8,465	8,620
Niobium (columbium)-tantalum ores and concentrates, gross weight:					
Columbite and tantalite <sup>e</sup>	456	456	456	456	456
Djalmaita concentrate <sup>e</sup>	10	10	10	10	10
Pyrochlore concentrate, Nb <sub>2</sub> O <sub>5</sub> content	81,922	60,692	88,920	63,320	63,500
Rare-earth metals, monazite concentrate, gross weight	1,173	834	303	249 <sup>r</sup>	250
Silver <sup>7</sup>					
Primary kilograms	36,000	35,500	35,000	37,000 <sup>r</sup>	36,500
Secondary do.	32,000	31,500	31,000	32,000 <sup>r</sup>	32,000
Total do.	68,000	67,000	66,000	69,000 <sup>r</sup>	68,500
Tin:					
Mine output, Sn content	11,835	13,899 <sup>r</sup>	9,500	10,400	9,550
Metal, smelter:					
Primary	9,384	11,020 <sup>r</sup>	8,311	9,098	8,350
Secondary <sup>e</sup>	250	250	250	250	250
Total	9,634	11,270 <sup>r</sup>	8,561	9,348	8,600
Titanium:					
Ilmenite:					
Gross weight	74,500 <sup>r</sup>	130,000	52,800	166,000	166,000
TiO <sub>2</sub> content	55,200 <sup>r</sup>	96,292 <sup>r</sup>	39,117	123,391	123,400
Rutile, TiO <sub>2</sub> content	2,820 <sup>r</sup>	2,309 <sup>r</sup>	2,737	2,519	2,520
Tungsten, mine output, W content	537	408 <sup>r</sup>	192	166	170
Zinc:					
Mine output, Zn content	193,887	173,933	172,688	211,203	206,130
Metal, smelter, primary	265,126	248,874	242,136	288,107	281,190
Zirconium, zircon concentrate, gross weight <sup>8</sup>	26,739	25,346 <sup>r</sup>	34,248 <sup>r</sup>	23,235 <sup>r</sup>	23,200

<sup>e</sup>Estimated; estimated data are rounded to no more than thee significant digits; may not add to totals shown. <sup>P</sup>Preliminary. <sup>r</sup>Revised. do. Ditto.

<sup>1</sup>Table includes data available through December 31, 2012.

<sup>2</sup>In addition to the commodities listed, bismuth, molybdenite, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

<sup>3</sup>Direct sales and (or) beneficiated (marketable product).

<sup>4</sup>Source: Cobalt Development Institute (<http://www.thecd.com/cdi/images/documents/Co20Production202011.JPG>); Departamento Nacional de Produção Mineral, 2011 and 2012.

<sup>5</sup>Reported figure.

<sup>6</sup>Includes sponge iron, in metric tons, as follows: 2007 through 2011—270,000 (estimated).

<sup>7</sup>Officially reported output. Of total production, the following quantities are identified as secondary silver (the balance being silver content of other ores and concentrates), in kilograms: 2007—50,000 and 2008 through 2011—45,000.

<sup>8</sup>Includes baddeleyite-caldasite.



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