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MINING - METALLURGY

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MINING IN BRAZIL

**STILL GROWING,
DESPITE THE PANDEMIC**

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BRAZIL PUTS ITS POTENTIAL ON DISPLAY

Even battling the Covid-19 pandemic, the Brazilian mining industry performed remarkably well in 2020, ending the year with a record output figure, in local currency terms. This outcome was in marked contrast to expectations in the first quarter, when the pandemic was still beginning to spread around the world and forecasts for the industry were dire, for two reasons: first, the pandemic had begun in China, the world's largest consumer of mineral commodities, and second, many countries' economies seemed to be on the verge of collapse.

In Brazil, the government decreed early on, as a lockdown measure, that only a handful of economic sectors, deemed essential, were to continue in activity. Mining was not on the list. However, entrepreneurs soon mobilised and successfully lobbied for mining to be reclassified as essential, on the grounds that its products enter the supply chain that produces, in turn, goods that are necessary to many areas, including health. As a result, and unlike what happened in some other Latin American countries such as Chile, Peru, and Mexico, Brazilian mining was able to remain in operation, while naturally needing to adopt a series of preventive measures against Covid-19, protecting the health and safety of the workforce.

On the market side, China surprised the world when it began to recover from the pandemic much earlier than had been expected, and restarted productive activity so quickly that many people are still surprised. And, given that China is today the engine driving the world economy, demand speedily warmed up and so did the prices of mining products. As a result, for many mining companies in Brazil the fourth quarter of 2020 was one of their best quarters ever.

In these early months of 2021, despite the uncertainties about the pandemic that have still not been cleared away, the mining industry in Brazil is in an optimistic mood, to judge by the level of investments now under way or planned for the

future, as will emerge throughout this issue of the international edition of *Brasil Mineral*. In both gold and iron ore — two products in which Brazil is among the world leaders — there are several such ventures, as there are also in copper, manganese, zinc, nickel, cobalt, niobium, lithium, vanadium, rare earths, and others, without mentioning those products supplied mainly to the domestic market, such as limestone and a range of industrial minerals.

With the unrealised potential of its extensive land area, Brazil does not yet occupy the position that it could in the ranking of world mineral producers. Its output, expressed in dollar terms, still lags a long way behind that of other countries, even though it ranks as the world's second largest iron ore producer, the third largest bauxite producer, and the leading niobium producer. In gold, Brazil appears in a very modest eleventh place, even though, in a now remote past, it once supplied, via Portugal, the gold that crammed the coffers of the British Treasury.

Brazil's mineral potential remains largely unknown and unexplored. Only a very small fraction of its land area has been mapped at the scale of 1:100,000, and an even smaller fraction at 1:50,000. This means that much more investment is needed in exploration, on the part of the government and the private sector alike. Companies that believed in exploration in Brazil, and invested in it, are now reaping their reward. An outstanding example is Ero Copper in the Curaçá Valley, in the state of Bahia. Another example is the still preliminary work being done in the Alta Floresta mineral province by Anglo American, Vale, and Nexa.

Even so, the volume of planned investments shows that the mining industry can continue to achieve impressive growth rates in coming years, and that Brazil can expect to expand its share of world mining output. The articles in this edition seek to substantiate this expectation. □



Francisco Alves, Editor

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EVEN IN YEAR OF PANDEMIC, BRAZIL'S MINING OUTPUT ACHIEVES HIGH GROWTH RATES

Francisco Alves

Despite the Covid-19 pandemic, Brazil's mining output grew at the impressive year-on-year rate of 36 percent in 2020, in local currency terms, due mainly to the convergence of three factors. First, a government ruling allowed mining to be

listed as one of the essential activities that were allowed to carry on operating during the pandemic. Second, the market for mineral commodities, after sustaining a hefty negative impact in the first quarter, staged a steady recovery from the second quarter



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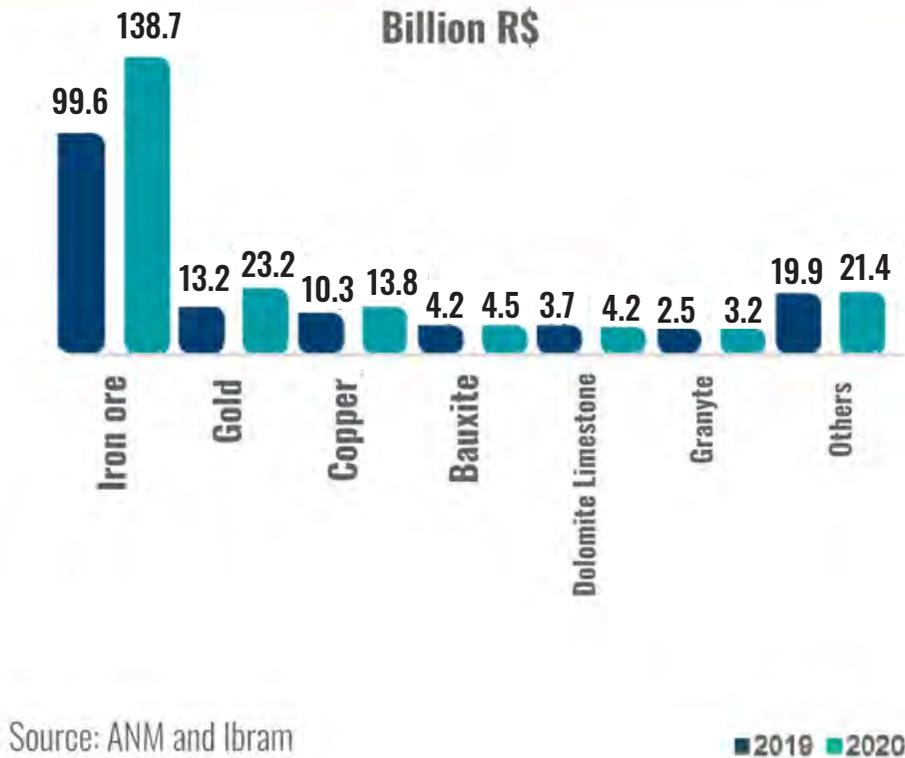
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Revenues by Mineral – 2020 x 2019



onward, and the prices of several mineral commodities produced in Brazil performed well. Third, the sharp devaluation of the real against the dollar boosted companies' sales income in local currency terms.

The three main mineral commodities produced in Brazil — iron ore, gold, and copper — experienced favorable market conditions, mainly in price terms, despite the prevailing economic crisis. In the case of iron ore, the surprising speed at which China regained its earlier level of economic activity, in conjunction with lower tonnages from Vale, the world's leading producing company, meant that prices held up at fairly

remunerative levels for producers. The price peaked at US\$ 155.84 per metric ton, with an average price for the year of US\$ 97.

Gold — invariably a safe refuge for investors in times of crisis — rose to a price level that no one would have dared to forecast before the pandemic, reaching an all-time high of US\$ 2,067.15 per ounce. In the case of copper, as the outcome of a temporary halt in production in both Chile and Peru, which are both large-scale producers, prices were similarly sustained at a satisfactory level, closing the year at US\$ 7,893 per ton.

Total Brazilian mining output in 2020, calculated on the basis of revenues from

Main minerals produced in Brasil - 2020^(*)

Ranking	Mineral	Number of operations	Output value (In Reais)	CFEM value (In Reais)
1	Iron ore	122	138,691,650,626.51	4,825,265,105.19
2	Gold ore	742	23,235,819,280.62	351,662,825.90
3	Copper ore	16	13,798,783,583.13	273,850,888.37
4	Bauxite	84	4,498,977,920.37	131,218,685.34
5	Dolomitic Limestone	655	4,177,874,669.97	101,870,822.25
6	Granite	888	3,174,462,406.39	34,767,403.01
7	Phosphate	23	2,063,147,581.67	41,429,215.97
8	Sand	4188	1,863,146,404.27	23,913,125.53
9	Basalt	798	1,630,008,214.61	16,858,626.69
10	Nickel ore	9	1,453,570,848.64	29,095,444.59
11	Gneiss	262	1,156,079,188.27	12,851,229.20
12	Anthracite	37	880,179,032.09	19,660,364.82
13	Manganese ore	47	844,086,786.21	26,035,351.11
14	Kaolin	49	832,475,442.38	16,138,902.15
15	Niobium ore	19	716,626,267.07	21,638,732.51

(*) Excluding mineral water

Source: ANM - National Mining Agency

the Financial Contribution on Mineral Exploitation (CFEM), can be estimated at R\$ 209.0 billion, equivalent to US\$ 40.5 billion at the year's average exchange rate of R\$ 5.16 to the dollar. In comparison with the preceding year, total output in local cur-

rency terms increased by approximately 36 percent, though in dollar terms the increase was very much smaller, only fractionally above 6 percent. The real was one of the currencies that devalued most sharply against the dollar in the course of the pandemic.



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Foreign Trade 2020

Billion US\$
Share %



Source: Ibram

According to Brasil Mineral’s calculation and also that of Ibram (the Brazilian Mining Institute, a private-sector organisation), the 2019 total for the country’s mineral output was R\$ 153.4 billion. In dollars, the official data show an amount of US\$ 38 billion. It needs to be pointed out that this total includes a figure of R\$ 3.3 billion for mineral water, which under Brazilian legislation counts as a mineral product, and is produced by 702 operations now in activity.

Iron ore, with 122 operations of all sizes, has historically been the leading product in the Brazilian mining industry, and ended 2020 with an output figure of R\$ 138.7 billion (approximately US\$ 26.9 billion), accounting for two-thirds of the country’s overall mineral output in the year.

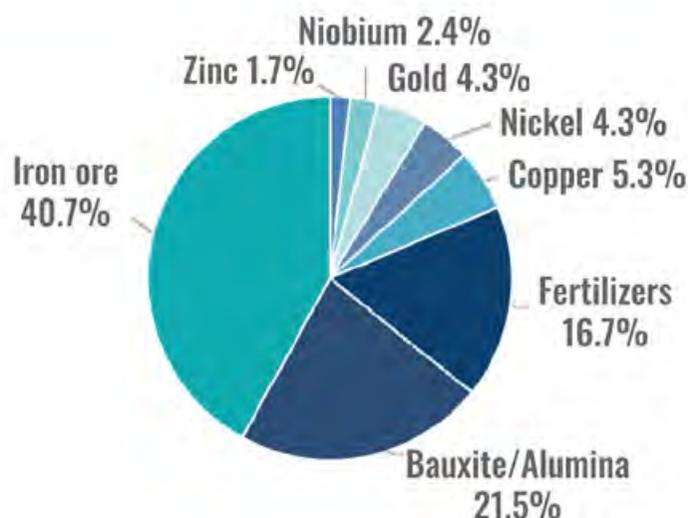
In second place, in value terms, comes gold, of which Brazil is the eleventh largest

producer worldwide. Gold is mined at 142 sites in Brazil, largely concentrated in just two states, Minas Gerais and Pará. The year-end total was R\$ 23.2 billion (US\$ 4.5 billion).

Copper, with an output of R\$ 13.8 billion (US\$ 2.67 billion) achieved by sixteen mining operations, ranked third in 2020, followed by bauxite (aluminium ore) with 84 operations in activity, with R\$ 4.5 billion (US\$ 872 million).

Brazil’s fifth most important mineral product is dolomitic limestone, produced wholly for the domestic market, with 655 operations. The 2020 total was R\$ 4.18 billion (US\$ 809 million). Other minerals produced on a significant scale are granite, phosphate, sand, basalt, nickel, manganese, china clay, niobium, tin, zinc, chromium, and vanadium. In the case of the last two mentioned, Brazil is the sole producing country in the Americas.

Investment by mineral



Source: Ibram

CFEM and the trade balance

In 2020, the mining industry generated revenue under the CFEM (Financial Contribution on Mineral Exploitation) amounting to around R\$ 6.1 billion, for a 35.5 percent increase over the preceding year. Iron ore accounted, once again, for the largest share: R\$ 4.82 billion or 79 percent of the total. Gold ranked second with a figure of R\$ 351 million (5.7 percent), followed by copper ore at R\$ 273 million (4.4 percent), aluminium ore at R\$ 131 million (2.1 percent), and dolomitic limestone at R\$ 101 million (1.6 percent).

Exports of mineral products, including primary metals, according to the data for 2020 released by Ibram, added up to US\$ 37 billion, for an 11 percent increase in the year. This figure represented 17 percent of all Brazilian exports in 2020, which totalled US\$ 210 billion. In terms of the trade

balance, mineral exports contributed 64 percent, or US\$ 32 billion, to the US\$ 51 billion overall trade surplus. Altogether, Brazil imported US\$ 159 billion in the year.

The bigger trade surplus in mineral products is explained not only by increased exports but also by a steep fall in imports, more than halved in comparison with 2019. Imports of mineral products amounted to US\$ 4 billion in 2020, down from US\$ 8 billion a year earlier. The two main import products, potassium and metallurgical coal, were both sharply down in the year: potassium by almost one-quarter, from US\$ 3.47 billion in 2019 to US\$ 2.62 billion in 2020, and metallurgical coal down 44 percent from US\$ 2.88 billion to US\$ 1.61 billion. The drop in demand for metallurgical coal was mainly due to Brazil's declining steel production in the first half of 2020. Copper — a metal that Brazil both imports and

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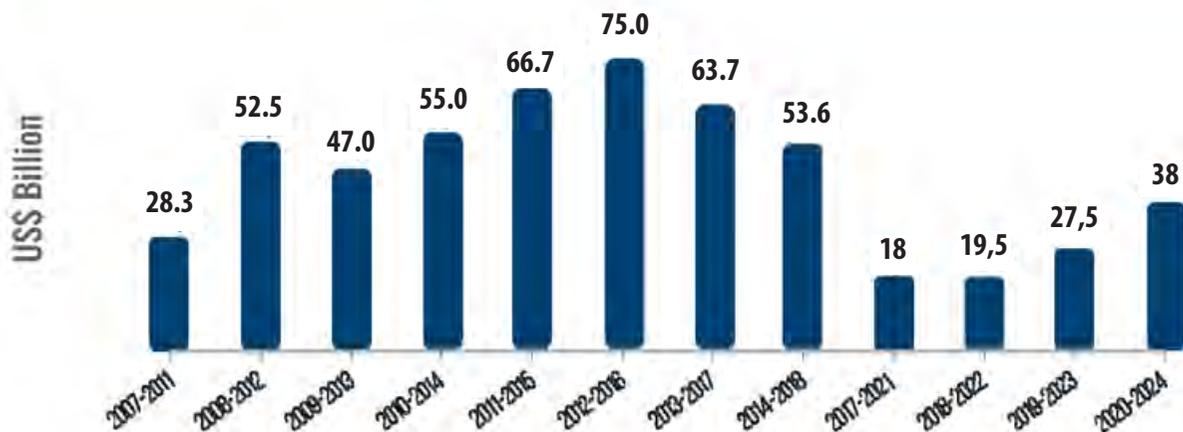
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Investment estimates in the mineral sector



* Includes US\$ 22 billion for investment in tailings dams decommissioning and dry stacking

exports — also fell steeply in 2020, down 41 percent from US\$ 728 million in 2019 to just US\$ 428 million last year.

Brazil's main export product in the minerals sector was iron ore, with a volume of 342 million tons yielding US\$ 26 billion. That was 16 percent more than in 2019, in dollar terms, though in volume terms the tonnage grew at an almost imperceptible rate of 0.3 percent. In dollar terms, in 2019 iron exports had totaled US\$ 22 billion. China was, once again, the main export market for iron ore, taking 72 percent of the total.

Gold ranked second on the list of mineral exports, with a 2020 figure of US\$ 4.9 billion, up no less than 36 percent from the previous year's figure of US\$ 3.6 billion. In volume terms, last year's exports amounted to 99 metric tons, or about 3.18

million ounces, 8 percent more than in 2019.

Copper, the third ranking item on the mineral exports list, amounted to US\$ 2.4 billion, up a modest 7 percent from the previous year's figure of US\$ 2.3 billion.

Niobium, of which Brazil is both the world's leading producer and exporter, showed a steep drop in exports in 2020, down more than one-third from US\$ 2.3 billion in 2019 to US\$ 1.5 billion in 2020. Ornamental rocks, a niche in which Brazil is a major supplier to world markets, remained practically unchanged in the year at around US\$ 1.0 billion. Other products contributing to Brazil's trade surplus in minerals were bauxite, china clay, and manganese. Bauxite exports were down 34 percent from US\$ 258 million in 2019 to US\$ 170 million last year. China clay was

down 18 percent, from US\$ 153 million to US\$ 125 million, while manganese fell 28 percent, from US\$ 483 million to US\$ 347 million. The Chinese market alone accounts for almost 80 percent of Brazil's manganese exports.

Investments

The Brazilian mining industry is expected to achieve further significant growth rates in the next few years, on the evidence of the volume of investments announced by companies. According to data from Ibram, the private-sector Brazilian Mining Institute, investments forecast for the 2020-2024 period add up to US\$ 38.0 billion, including capacity expansion at existing mines as well as wholly new ventures. This total is a considerable advance on Ibram's earlier estimate for the 2019-2023 period, which was US\$ 27.5 billion.

Iron ore projects account for the lion's share of planned investments, 40.7 percent of the total. In second place, with a 21.5 percent share, come bauxite and alumina projects, followed by fertilisers (16.7 percent), copper (5.3 percent), nickel (4.3 percent), gold (also 4.3 percent), niobium (2.4 percent), and zinc (1.7 percent). The Ibram survey shows a total of US\$ 2.2 billion earmarked for technological solutions for the disposal of tailings. In value terms, the iron ore projects add up to US\$ 15.5 billion, bauxite and alumina to US\$ 8.2 billion, fertilisers US\$ 6.0 billion, copper US\$ 2.0 billion, gold and nickel US\$ 1.6 billion each, niobium US\$ 900 million, zinc US\$ 660 million, and all others US\$ 5.5 billion, including magnesite, manganese, limestone, lithium, and quartzite. □



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MINERAÇÃO TABOCA TRANSFORMS OPERATING PROCESSES AND GOVERNANCE AND BECOMES A GLOBAL TANTALUM PLAYER

A Minsur group company and one of the leading producers of refined Tin, Taboca promotes an intense process of corporate transformation.

With most of its industrial operations in the Brazilian Amazon rainforest, **Mineração Taboca S.A.** celebrates the results of a daring transformation process, in progress since 2016. The proposal is to create value for the company with a focus on greater productivity and efficiency, product qualification and evolution of international good ESG practices. Taboca is the largest producer of refined Tin in Brazil and an expressive player in the Tantalum market.

"The transformation in operating processes and governance has allowed the establishment of production and marketing routes for new mineral products, the opening of new business opportunities and the increased volume of the company's product offering resulting in the multiplication of revenues by more than 70%, in Brazilian Reals, in just four years", says Daniel Santos, CEO of the company.

In US dollars, revenues grew 15% between 2016 and 2020 due to increased production and sales capacity, as well as price volatility in the Tantalum market caused by the trade dispute between China and the USA, especially due to 5G. In 2020, these revenues could have been 15% higher if Covid-19 had not interrupted the activities temporarily.



Tantalum, Rare-Earth Elements, Cryolite and other minerals, such as Zirconite and Uranium, make up the mining company's portfolio. The Pitinga mineral deposit, belonging to Mineração Taboca, is located in the state of Amazonas and is among the largest Tantalum and Tin deposits in the world.

Based on Taboca's certification of resources and reserves from April 2019, Pitinga's LOM (Life of Mine) expects continued operation until mid-2050. "In 2021, there will be a new statement of resources and reserves audited and certified externally. We expect an increase of 13% in reserves compared to the previous year, already discounting the ore mined in the periods considered among the audited statements", says Daniel Santos.

The mining company's strategic planning establishes projects aimed at the use of slag, circular economy, environmental excellence, and operational safety.

TANTALUM IS A SOURCE OF OPPORTUNITIES

Experts point to the expansion of negotiations and appreciation of Tantalum prices. Taboca is well positioned in reserves. One source is the Pitinga mine. The longevity

of the geological occurrences can far exceed the certified reserves and includes various types of minerals, such as Tin, Tantalum, Rare-Earth Elements, Niobium, Zirconium, Hafnium, Cryolite, Uranium and Thorium.

Another source is the smelter located in the metropolis of São Paulo. It stores tons of slag with an expressive amount of Niobium and Tantalum, accumulated over decades of Tin smelter operations.

STRATEGIC ORES AND THE RESUMPTION OF CRYOLITE PRODUCTION

Establishing commercial destination for radioactive ores, such as Uranium, and developing industrial production and commercialization routes for Rare-Earth oxides are part of the long-term studies. In addition, Taboca intends to evaluate the production of Cryolite, an ore that had world reserves depleted in the 1980s. It could be used to produce hydrofluoric acid, a basic input for the project to improve Niobium and Tantalum ferroalloy products, in addition to enabling the production of Rare-Earth elements, and also to be offered as an input to the Aluminum industry.

PLANS TO STRUCTURE A RECYCLING PARK

Taboca is considering to install a smelter operation in the city of Manaus, capital of the state of Amazonas. If the plan is implemented, the proposal is to transform the São Paulo plant into a recycling park to extract Niobium and Tantalum by-products from slag. The goal is to increase the share of the company in these markets, in addition to recycling waste from other industries, avoiding idleness and generating revenues.

PROCESSES QUALIFY TABOCA'S PRODUCTION

Controlled, since 2008, by the Peruvian corporate group **Minsur S.A.**, one of the most relevant mining companies in South America and member of the International Council on Mining and Metals (ICMM), Taboca is a prominent player in the market for its Mamoré refined Tin, certified by the London Metal Exchange. Although the Tin content of the Pitinga mine is only 0.2%, the company is able to raise the concentrate content to 50%: 99.9% purity high grade refined Tin containing 0.005% maximum Lead.

INVESTMENT AND SUSTAINABILITY

In this period of corporate transformation, from 2016 to 2020, Mineração Taboca invested about US\$ 150 million in Brazil, mostly in operational improvement and expansion, as well as sustainability and operational safety. One of those actions was the replacement of its hydraulic

dams by a waste stacking system using these properly adapted structures.

The Pitinga enterprise occupies approximately 294 thousand hectares, of which 94.1% are preserved and 4.9% anthropized. Every year, Taboca invests US\$ 2 million in environmental monitoring and forest restoration of anthropized areas.

TABOCA OBTAINS UNPRECEDENTED CERTIFICATION ON SAFE ENVIRONMENT FOR COVID-19

Taboca's evolution provided an increase of 14% in the hiring of workers in 2020. The company was able to overcome the difficulties caused by the Covid-19 pandemic, supporting nearby communities to fight against Covid's problems, and becoming the first mining company operating in Brazil to obtain the A2S certification of 'Safe and Healthy Environment' in the fight against the contamination.

The A2S certification is issued by Fundação Vanzolini, one of Brazil's leading standard certifiers. According to José Flávio Alves, Director of Human Resources and Infrastructure at Mineração Taboca, "this certification is an important tool for the company to demonstrate and ensure an environment with all the appropriate protective measures, offering safety and protection to employees, maintaining its production and thus continuing with good results, even in this time of pandemic".

MINERAÇÃO TABOCA S.A.

History	1969	Foundation date of the mining company
	2008	Minsur mining group (Peru) acquires shareholding control
Industrial units	Pitinga Mine	In the municipality of Presidente Figueiredo (state of Amazonas). The mineral deposit is among the largest Tin and Tantalum deposits in the world.
	Tin smelter	In the metropolitan region of São Paulo
	Privately owned hydroelectric power plant	In Presidente Figueiredo, with 26MW
Employees	Employees	1,449
	Outsourced employees	1,200
Capacity	Tin ingots	6,500 tons/year
	Ferroalloys	4,000 tons/year
Revenues	2016 - 2020	70% growth in R\$
		15% growth in US\$
Investment	2016 - 2020 (Total)	US\$ 150 million
	Environmental actions	US\$ 2 million/year



NX Gold's Nova Xavantina mine

WHICH MINERALS ARE ATTRACTING MOST INVESTMENTS IN BRAZIL?

Francisco Alves

Iron ore, gold, copper, nickel, zinc, and the so-called minerals of the future (such as lithium, niobium, rare earths, and vanadium) are the minerals with the most favourable growth prospects in Brazil, on the basis of the number of projects

and the capital spending budgets planned for the next few years. These product categories are attracting a substantial percentage of the total US\$ 38 billion to be invested in mining, between now and the end of 2024.



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GOLD

Gold mining has warmed up in Brazil, since the price increase and the devaluation of the real have combined to enhance the feasibility of ventures affording a favourable return on investment.

Belo Sun developing Brazil's largest project

Belo Sun, controlled by the Forbes & Manhattan group, has the largest gold project currently under development in Brazil, Volta Grande, located in the municipality of Senador José Porfírio, near Altamira in the state of Pará.

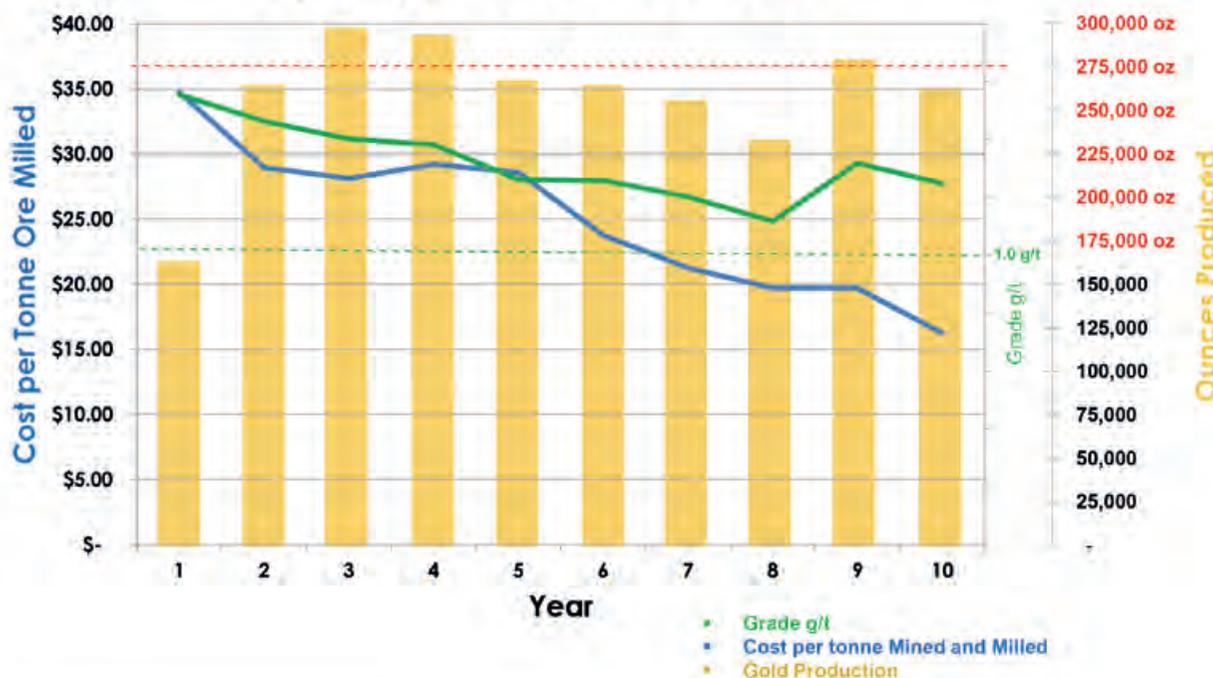
With a capex projected at US\$ 298 million (last updated in 2020), the venture is expected to produce 268,000 ounces of

gold per year in the first ten years and an overall total of 3.53 million ounces over the lifetime of the mine, at an all-in sustaining cost (AISC) of US\$ 779 per ounce of gold. The feasibility study was based on estimated reserves of 3.8 million ounces and resources (measured and indicated) of 5.0 million ounces. For budgeting purposes, the gold

Mining Highlights (first 10 years)



Operating Costs and Annual Production*



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INVESTMENTS

price is stated as US\$ 1,200 per ounce.

Belo Sun obtained an Installation Licence for the venture in 2017, but the project was put on hold pending the submission of a survey of the impact on indigenous communities. The study was redone and resubmitted to Funai, the National Indigenous Foundation, in February 2020. In August 2020, Funai requested further explanations, which were duly submitted in October. Funai approved the study in December 2020, and now the company will present it

to the indigenous communities themselves and then to a court in Brasilia, requesting the end of the suspension of the Installation Licence. Once that request is granted, the company will start implementing the venture. Belo Sun is currently in negotiations with prospective partners in the Volta Grande project. The expectation is that the partners in the joint venture will hold a roughly 50 percent share of equity and will assume responsibility for the whole of Belo Sun's capital spending obligations.

Amarillo ready to build at Mara Rosa



An Amarillo Gold team engaged in fieldwork

Amarillo Gold is now ready to start construction at its Posse project, located at Mara Rosa in the state of Goiás, having finally received an Installation Licence. The Posse project comprises an open-pit gold mine and a carbon-in-leach (CIL) plant, with dry storage of tailings. A feasibility

study concluded in June 2020 showed that Posse will produce gold at an AISC cost of US\$ 656 per ounce, based on a gold price of US\$ 1,730 per ounce and an exchange rate of R\$ 5.30 to the dollar. The mine has an initial lifetime of ten years, an output of 102,000 - 104,000 ounces of gold per year in

SERABI MINERAÇÃO S/A

Building Brazil's next mid-tier gold company
(LSE:SRB | TSX:SBI)

Serabi Mineração is a gold exploration and production company involved in the evaluation and development of gold deposits in Brazil. The company's primary interests are its 100% owned Palito Mining Complex and the recently acquired Coringa Gold Project both located in the Tapajos region of northern Brazil. Combined gold production from the Palito Mining Complex is currently approximately 40,000 ounces per annum, whilst the Coringa Project, when in production, is forecast to produce an average of 38,000 ounces per annum.



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the first four years, and a present value, after tax, of US\$ 360 million. The current expectation is that the operation will be brought on stream in the second half of 2022.

Now that it is in possession of its Installation Licence, the company is readying a plan for executing the project, with construction to begin as soon as possible, probably in March, immediately after the end of the rainy season. However, Amarillo is bringing forward the ordering of machinery and equipment that require a long delivery term, such as crushers, grinding mills, and a filtration plant.

In parallel, the company is discussing with potential investors its plans to raise a loan of approximately US\$ 100 million, to complement the funds needed for implementation of the venture, budgeted at US\$ 145 million. In August 2020 Amarillo raised

US\$ 57 million, of which it is still holding US\$ 50 million in cash. During the construction stage, the project will create 700 jobs in direct employment and a further 2,000 jobs in indirect employment.

Amarillo is also committed to an exploration plan, for which it has earmarked US\$ 2 million in 2021, partly at Mara Rosa and partly at other areas it holds at Lavras do Sul, in the state of Rio Grande do Sul, for the purpose of enlarging its reserves and resources. At Mara Rosa, the drilling already done has identified reserves amounting to some 200,000 ounces, while the work still to be done in 2021 is expected to add to this volume. The effect will be to extend by around two years the expected lifetime of the Mara Rosa mine, apart from the possibility that further underground resources will be discovered that can be worked in the future.

Equinox Gold expands activity in Brazil

Equinox Gold, which in mid-2019 restarted its Aurizona operation in the municipality of Godofredo Viana in Maranhão, in which it invested US\$ 197 million to set up a unit with a capacity of 136,000 ounces of gold per year, has new investments planned in Brazil, both for expanding output at Aurizona and at the mines it acquired as a result of its merger with Leagold.

At Aurizona, the company now has a pre-feasibility study for an underground mine, at a capital cost estimated at US\$ 69.7 million. The underground mine will be able to operate in conjunction with the existing open-pit mine, with the potential

to produce 740,500 ounces of gold in the course of a ten-year lifetime, yielding income of around US\$ 1 billion, considering a gold price of US\$ 1,350 per ounce. This would require crushing 2,800 tons of gold-bearing rock per day. The projected AISC is US\$ 925 per ounce.

Equinox recently announced positive drilling results in two target areas at its Aurizona mine, known as Piaba Underground (Piaba UG) and Genipapo. The underground drilling program known as Piaba 2020 yielded exceptionally favourable results, with 96 percent of all holes crossing significant gold

Thinking about the future and developing a new sustainable way of mining manganese in Brazil



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mineralisation. The drilling extended more than 3 km from the Piaba deposit, currently 4 km long, and tested depths of up to 1,000 metres below the surface. For 2021, the company plans an exploration program at Aurizona, budgeted at US\$ 7.3 million, drilling an aggregate 49,000 metres, with the aim of enlarging the Piaba resource and advancing the various regional target areas, close to the top-priority, high-potential mine in the Aurizona mineral district. Equinox also has a pre-feasibility study now in progress, to be concluded at the end of 2021, to evaluate the operational potential of the underground mine in conjunction with the existing open-pit mine .

By the end of March 2021, Equinox is to begin work with the aim of restarting operations at its Santa Luz project, calling for investments of US\$ 101 million. This venture came under Equinox Gold's ownership in March 2020, when the company acquired Leagold Mining Corp., whose as-

sets in Brazil included four ventures, Santa Luz, Fazenda Brasileiro, Pilar, and Riacho dos Machados.

Santa Luz was operated by Yamana Gold in 2013 and 2014, as an open-pit mine, until it was reclassified as "care and maintenance" due to the disappointing results of the carbon-in-leach (CIL) metallurgical recovery. Test programs carried out later, that included bringing a pilot plant on stream, demonstrated that the resin-in-leach (RIL) method was more effective for recovering gold at this project.

The project is currently in the stage of the detailed engineering of the changes that will have to be made at the processing plant, enabling production to restart, which will also include an increase in holding capacity for tailings and water, and restarting pickling operations and open-pit mining. The alterations and improvements at the processing plant and holding units are scheduled for completion in 2021, while pickling is due to begin in February.



Gold production complex in Maranhão operated by Aurizona, controlled by Equinox Gold

Yamana plans further expansion at Jacobina

Yamana Gold, acting through its subsidiary Jacobina Mineração, is planning stage 2 of its expansion project at Jacobina, which will raise processing capacity to 8,500 tons per day and the gold recovery rate from the present 96 percent to 97 percent. Alterations at the plant include replacing the tertiary crushing mill with a new one having a greater capacity, and adding a new ball mill and an extra silo. With this expansion, gold

output at Jacobina will increase to around 200,000 ounces in 2022, subsequently rising to an average 230,000 ounces per year from 2023 onward.

The investment earmarked for Stage 2 of the expansion project is approximately US\$ 57 million, comprising US\$ 35 million for the processing plant, US\$ 14 million for the underground mine, and US\$ 8 million for infrastructure.



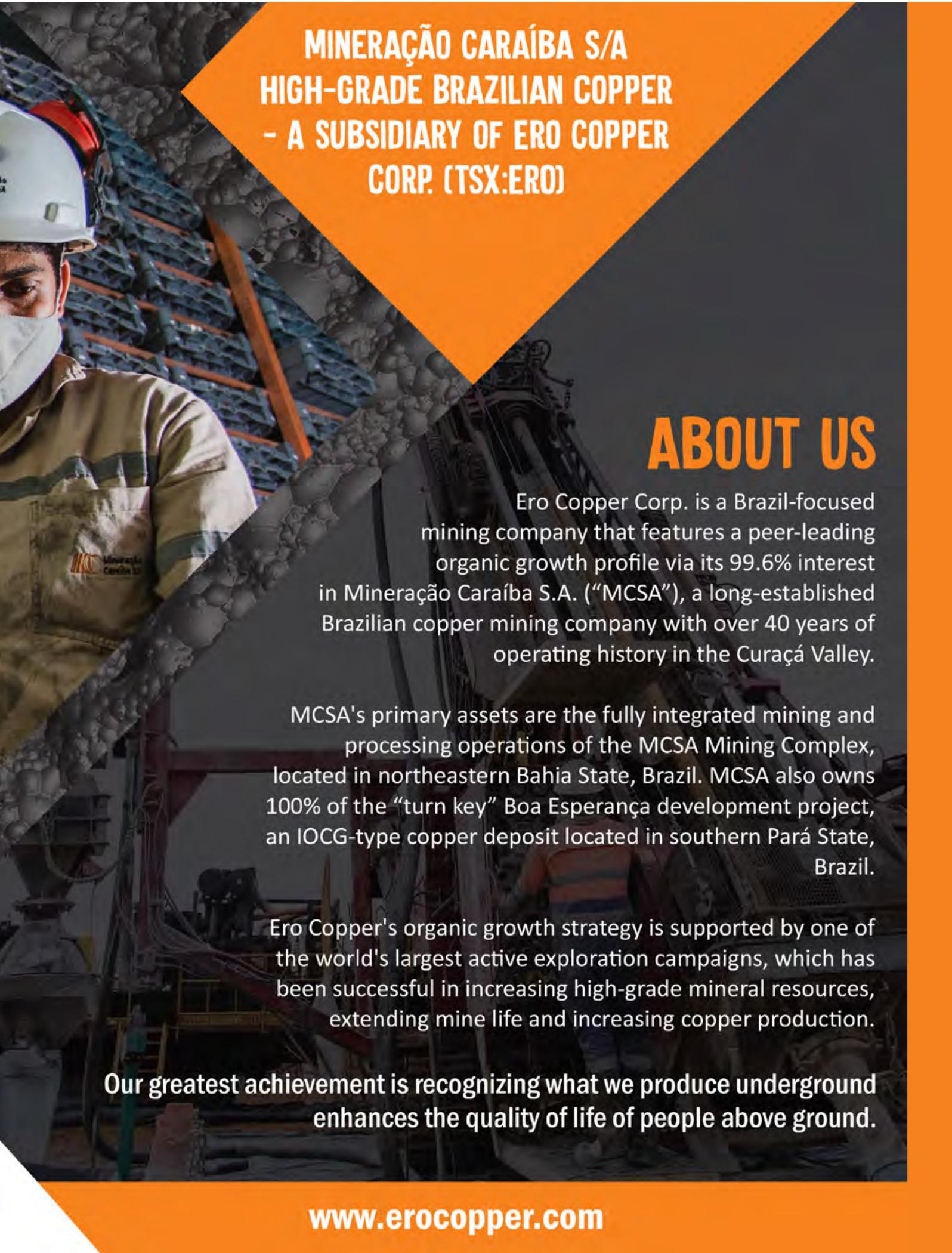
Yamana Gold's operation at Jacobina



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ABOUT US

Ero Copper Corp. is a Brazil-focused mining company that features a peer-leading organic growth profile via its 99.6% interest in Mineração Caraíba S.A. (“MCSA”), a long-established Brazilian copper mining company with over 40 years of operating history in the Curaçá Valley.

MCSA's primary assets are the fully integrated mining and processing operations of the MCSA Mining Complex, located in northeastern Bahia State, Brazil. MCSA also owns 100% of the “turn key” Boa Esperança development project, an IOCG-type copper deposit located in southern Pará State, Brazil.

Ero Copper's organic growth strategy is supported by one of the world's largest active exploration campaigns, which has been successful in increasing high-grade mineral resources, extending mine life and increasing copper production.

Our greatest achievement is recognizing what we produce underground enhances the quality of life of people above ground.

www.ero-copper.com

Serabi presses ahead with Coringa project

Serabi God, which in 2020 celebrated twenty years in operation, is now focused on advancing the licensing process for its Coringa project in Pará. The company has already obtained its Preliminary Licence and it has also settled outstanding legal issues connected with indigenous communities. It now hopes to be able to start implementing the venture very soon. The scale of operations at Coringa is 30,000 ounces per year.

The estimated capex for this project is a range from US\$ 25 million to US\$ 30 million. This is a relatively modest amount, given the scale of the expected output, affording a rapid return. The company's operating cost currently stands at around US\$ 1,200 per ounce. Five target areas have been identified, on which the projected output calculations are based.



Serabi's São Chico mine

Aura Minerals has new projects in Brazil

Following a successful IPO on Brazil's B3 stock exchange in 2020, Aura Minerals has announced that its board has approved the Almas project for an open-pit gold mine in the state of Tocantins. The project is expected to come on stream in the second half of 2022 at a total investment cost, after tax, estimated at around US\$ 73 million and

a net present value (NPV) after tax of US\$ 183 million, assuming the weighted average of the consensus of market analysts for an average gold price of US\$ 1,558 per ounce over the projected period. Assuming a price of US\$ 1,800 per ounce, the internal rate of return (IRR) after tax is stated as 57 percent, and the NPV after tax as US\$ 260 million.

In the first four years of operation, annual output is projected at 51,000 ounces, with a useful lifetime of seventeen years, based on the estimated volume of mineral reserves. The Almas project is wholly owned by Aura.

Construction is scheduled to begin in April 2021, ramp-up for the third quarter of 2022, and production on a commercial scale in the fourth quarter of 2022.

The company is confident that Almas has the potential to increase its resources and reserves in other areas, located within the boundaries of its present licences, as the result of additional drilling, although this prospect is not taken into account in the survey.

The same company owns, in Brazil, the Ernesto mine, located at Pontes e Lacerda, that was first opened in 2020, initially planned as an underground mine but now being worked as an open-pit mine instead.

The capital spending is now almost complete. The mine is expected to come on stream in late 2021 or in 2022. It will enable the company to boost its overall output from 65,000 to close to 100,000 ounces.

Another of Aura's projects in Brazil is Matupá, which at the moment has no reserves but only resources, amounting to 350,000 ounces, because no metallurgical testing has yet been carried out, neither have the mine and plant been designed. The company is currently engaged in these studies, with a view to converting the resources into reserves by the end of 2021, and possibly initiating implementation in 2022.

As these projects come on stream, in addition to expansion projects in Mexico and the United States, Aura hopes to be able to achieve, in 2024, a global output in the range from 400,000 to 480,000 ounces.



The Ernesto mine, belonging to Aura Minerals

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Biggest Mine in the Center west region of Brazil with up to 200 million tons.



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Quality assurance



TERRA GOYANA
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Kinross extends lifetime of its Paracatu mine



Kinross's mine at Paracatu

Kinross intends to maintain its gold output capacity at over 600,000 ounces a year, in the 2021-2023 period, through improvements in production, reprocessing of tailings, and taking high-grade ores from the western part of the pit at Paracatu, in Minas Gerais, where it operates one of the world's largest gold mining operations.

While Paracatu accounts for around one-quarter of Kinross's overall gold output, which in 2020 amounted to 2.4 million ounces, the 2020 result was slightly down from the previous year's record level of 619,000 ounces. Production costs held steady, and optimisation of the mining plan enabled the company to enlarge its estimate of the reserves, adding a further 911,000 ounces, which means a one-year extension of the mine's lifetime, now expected to end

in 2032. Kinross believes that working the higher grade ore and making further improvements to its production methods will result in a further extension of the mine's lifetime, adding at least four more years.

The company has budgeted investments of US\$ 900 million in 2021, slightly less than the US\$ 916 million invested in 2020. Despite this reduction in overall investments, the amount earmarked for Paracatu will increase, for the purpose of equipment purchases. A large part of the US\$ 270 million in sustaining capital scheduled for the Americas in 2021 will be allocated to Paracatu, including US\$ 70 million for mine development, US\$ 75 million for mobile equipment, US\$ 40 million for tailings storage, US\$ 25 million for a crushing plant, and US\$ 30 million for a leaching unit.

Great Panther focuses on enlarging reserves



Great Panther's Tucano mine

In 2020 Great Panther began an ambitious exploration program — under the leadership of a team of top-level senior geologists — with the aim of increasing its reserves and resources over the next three to five years. Most of the company's growth plans are related to increasing and exploring the potential gold reserves in an area of 7 kilometres, within a much larger area of nearly 2,000 square kilometres (about 770 square miles), where Great Panther holds the mining rights under a large number of licences.

In December 2020, the company released updated reserves and resources at Tucano,

enabling it to extend the lifetime of the Urucum and Taperebá pits, mined in recent years. This latest mining plan will introduce the transition to mining higher grade ores in 2022 and 2023.

This latest technical report shows that Tucano holds resources (measured and indicated) amounting to 16.2 million tons of ore having a gold content ranging from 0.53 to 4.11 grams per ton, which works out at a total 953,000 ounces of gold. Of this volume, 11.1 million tons, with a 1.5 gr/t content, is available for open-pit mining, with a potential output of 561,000 ounces. A further 2.8 million tons, with a gold con-



The first phase of the Pedra de Ferro mine in Bahia, Brazil has the capacity to produce up to 2 million tonnes per year, and the mine has total reserves of 535 million tonnes.



The high quality, low impurity nature of the ore means it is more environmentally friendly. As such, the 65% direct shipping ore being sold is helping reduce the environmental impact of the steel making industry.



With all material licenses and the FIOL railway concession having been granted, BAMIN is now pressing ahead with the construction of Porto Sul and the expansion of Pedra de Ferro to 18 million tonnes per year.



BAMIN is working towards becoming a market leader in sustainability and playing a critical role in the economic and social development of the communities where its projects are being established.

BAMIN DELIVERING HIGH QUALITY IRON ORE

BAMIN, a large integrated iron ore mining and logistics project of Eurasian Resources Group (ERG) in Brazil, began initial operations in January 2021. BAMIN will expand production to 18 million tonnes per year at full capacity.



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tent of 4.11 grams per ton, will require underground mining, and may yield 350,000 ounces. A further 2.49 million tons of ore is held in stockpiles, with a content of 0.53 grams, yielding 42,000 ounces. In the case of inferred resources, the total is 5.99 million tons of ore, of which 5.35 million tons is underground and could potentially yield 483,000 ounces of gold. For this reason, the company has not discarded the possibility of opening an underground mine at Tucano, at some future date.

In 2020, despite the pandemic, the Tucano mine managed to deliver a total gold output of 125,417 ounces, an improvement on the previous year. This volume was within the guidance for 2020, which was

the range from 120,000 to 130,000 ounces. The total volume of mined material rose 13 percent in comparison with 2019, partly as the result of operational improvements in the mine and partly, also, because a larger proportion of softer ore was taken from the Taperebá pits. The total volume of material processed at the plant was up 9 percent in the year, also as the outcome of improvements such as the additional automation to improve stability. The gold content of the ore was 6 percent lower, compared with 2019, as the effect of the wide variety of ores observed among the deposits. The factor that made the main contribution to the excellent results, the company says, was the people.

Trilha Gold begins small-scale project



A sample of gold ore at Trilha Gold's Serrita project

Trilha Gold Capital is preparing to open a mine in the municipality of Serrita, in the state of Pernambuco, covering an area of 2,000 hectares (7.7 square miles), where resources are estimated at over 3.5 million ounces, including other areas that the company holds in the same region. Before the end of 2021 the company will bring on stream an experimental plant, at an estimated cost of US\$ 3 million, and, following that, a pilot plant with a crushing capacity of 100 tons per hour and a potential gold output of 50,000 ounces a year. The investment

in this stage is budgeted at US\$ 10 million. During the expected five-year lifetime of the mine, the company will survey other areas in the region, where it believes it will be able to increase its reserves, possibly to as much as 5 million ounces, with an annual output of up to 200,000 ounces.

Apart from Pernambuco, Trilha Gold holds the rights to areas in other Brazilian states, with iron ore, manganese, and tantalite that it hopes to exploit at a future date, once its gold mine becomes fully operational.

Big River proceeds with Borborema project



Part of the Big River project

Big River Gold pressed ahead with preparations for implementing its Borborema project, located at Currais Novos in the state of Rio Grande do Norte, budgeted at US\$ 90.7 million. The project comprises a mine and processing plant having an initial capacity of 729,000 ounces of gold per year, over a period of 10.2 years. Activities now being carried out are a study of the the option of installing comminution circuits, to facilitate a possible future expansion; construction of

the water intake system; developing an additional water supply circuit; a project for an electric power transmission line on a scale compatible with plans for future capacity expansion; an exploration program aiming at higher-grade mineralisation, both in the existing pits and further afield.

In December 2020 the company announced a US\$ 15 million capital increase, for the specific purpose of developing and implementing the Borborema project.

IRON ORE AND MANGANESE

Iron ore, of which Brazil is the world's second largest producing country, behind Australia, continues to attract investments in new projects and capacity expansion, since prices have held up at fairly remunerative levels and there are no signs of any slackening in demand in the short term.

Vale aims at 400 million tons in 2022

Vale, which retains its position as the world's largest iron ore producing company, is committed to reaching a 400 million tons capacity in 2022. This means adding nearly 100 million tons a year to its 2020 output figure.

Of the planned total, 230 million tons would be mined in the Northern System (Carajás), 101 million tons in the Southeast System, 67 million tons in the Southern System, and 2 million tons in the Centre-West System. In the Northern System, there



Vale's S11D production unit



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will be an additional 24 million tons a year following ramp-up and opening of the new extraction fronts (the Gelado project and a 10 million ton expansion at S11D). In the Southeastern System, the Timbopeba unit will add 7 million tons a year to its present capacity, Brucutu will return to its earlier capacity, which means adding 17 million tons a

year, and an expansion project at Itabira will add 24 million tons a year. In the Southern System, output will be increased by 6 million tons at Fábrica and by 9 million tons at Vargem Grande. Vale is also developing its Capanema project, calling for a capex of US\$ 495 million, which will add 18 million tons to the company's overall output capacity.

CSN to boost output to 108 million tons per year



CSN's Casa de Pedra mine

CSN Mineração announced it is implementing an ambitious expansion plan enabling a gradual increase of its iron ore output capacity to 108 million tons a year by 2032. The investment is budgeted at R\$

31 billion (about US\$ 6 billion at the present exchange rate). The company says it is holding some 8 billion tons of ore in its reserves, and that this volume is more than sufficient to meet its needs for the next hundred years.

A strong point in the expansion plan is that it will not depend on tailings dams.

The expansion plan comprises four basic projects: (1) Expansion at the central plant, adding 6 million tons a year to pellet feed capacity and calling for an investment of R\$ 1.2 billion, spread over three years; (2) recovery of 180 million tons of tailings from the dams at Pires and Casa de Pedra, adding 8 million tons a year to present-day capacity, at a cost of R\$ 1.1 billion, to be disbursed over a five-year period; (3)

projects at Itabirito, with the construction of new plants or the expansion of existing ones, to produce premium pellet feed with a low impurities content and a high iron content, including direct reduction pellet feed; (4) expansion of the Tecar freight terminal, to accommodate the mine expansion. Handling capacity will increase in steps from 60 million to 84 million and then to 130 million tons per year, at a cost of R\$ 6.3 billion, to be disbursed in the course of eight years.

Samarco restarts operations after five-year hiatus



Samarco filtration plant

At the end of 2020, just two days before Christmas, Samarco restarted operations after a five-year stoppage. On that day it restarted pellet production at its Ponta Ubu plant, located at Anchieta in the state of Espírito Santo. This event marked the

return to the market of a producer that was formerly the largest single pellet producer in Brazil, until its activities were brought to a sudden standstill in 2015, when the Fundão tailings dam burst. On December 11, the company had already restarted ore

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production at its Mariana mine in Minas Gerais, bringing back on stream one of its three ore concentration units as well as the new tailings filtering plant.

The process of restarting production will be gradual, however. In the first stage Sa-

marco will operate at a capacity of between 7 million and 8 million tons of pellets per year, corresponding to 28 percent of its overall capacity. The company expects to take ten years to reach its full capacity of about 28 million tons a year.

Bamin begins production on a reduced scale



Bamin ships iron ore from Pedra de Ferro

From mid-August 2020, Bamin (Bahia Mineração), controlled by Eurasian Resources Group (ERG), began producing iron ore at its Pedra de Ferro mine, located in the municipality of Caetité in Bahia. Production began on a small scale only, at around 800,000 tons a year, because the very large project is still awaiting the completion of logistical infrastructure, mainly the planned Fiol railway.

The Pedra de Ferro project exploits a reserve holding 561.5 million tons of ore, mostly itabirite but including 181 million tons of hematite. The existing hematite reserve has an estimated lifetime of 13 years, but taking the itabirite into account, the

overall lifetime of the Pedra de Ferro project is thirty years, with the possibility of being further lengthened, since the company is continuing to conduct geological research that is expected to uncover new reserves and resources. Pedra de Ferro is an integrated project comprising mine, railway, and port.

Up until now, Bamin has invested some R\$ 1.8 billion in the Pedra de Ferro project, while additional disbursements still to come will amount to approximately R\$ 10 billion, considering the project as a whole. Since Bamin will be the main user of the railway, it has an interest in taking part in the project as an investor.

RENEWABLE ENERGY

THE FUTURE IS NOW

With an innovative strategy, Anglo American in Brazil is investing to make its energy consumption 100% renewable by 2022.

We have already reached a milestone of 96% in regard to renewable energy generation sources. In addition, we will soon become the first company in the Anglo American Group to be a producer of energy.

This is our contribution to the company's global goals, which aim to reduce 30% of its carbon emissions by 2030 and to achieve carbon neutral emissions by 2040.

This is how we are reimagining mining to improve people's lives.



Real Mining. Real People. Real Difference.

SAM awaits licence to begin implementation

SAM (Sulamericana de Metais), controlled by the Honbridge group of China, is awaiting the Preliminary Licence (LP) to begin engineering works at its Block B project, one of the largest iron ore ventures in the state of Minas Gerais, which will be a double breakthrough. First, it will open a new frontier for iron ore mining in the northeast of Minas Gerais; until now, this mining has been concentrated further south, in the so-called Iron Quadrangle. Second, it will demonstrate the feasibility of mining low-grade ore, previously considered scarcely different from tailings. The project is located in four municipalities in the region: Grão Mogol, Padre Carvalho, Fruta de Leite, and Josenópolis.

Once it comes on stream, the Block 8 project will produce 27.5 million tons a year of pellet feed, having an iron content of 66.2 percent. This ranks as a high-grade product, coming from an ore that has an average iron content of only 20 percent. To bring the project on stream, SAM will have to disburse, in the state of Minas Gerais



Work begins at SAM's Block B project

alone, US\$ 2.1 billion. The total invested so far in research, tests, and studies adds up to US\$ 74 million.

Buritirama invests in sintering and clean energies

In November 2020 Buritirama Mineração opened a sintering plant as part of its manganese project at Marabá, in the state of Pará. The capital cost was R\$ 130 million, and the company is confident that the new plant will enhance the value of the ore while adding a further 150,000 tons to operating capacity. Buritirama's new facility will reuse tailings

from the dam, transforming them into a useful, high-value product for industry.

The increased output resulting from the recovery of ore from tailings enabled the company to create 150 new jobs, bringing Buritirama's total workforce up to more than 3,500, including direct and indirect employment. With this project, the company will open the



Our team of mine builders is close to breaking ground on the Posse Gold mine in Goiás State. Our License to Install was granted earlier this year, and we've committed to building a dedicated power line from Porangatu to Mara Rosa, which will have a lasting effect on our community long after we're gone.

We take our responsibility to our community very seriously. We're investing BRL 600 million to build an operation that will produce 102,000 ounces of gold and create 1,200 jobs. We've launched a job training centre, and are partnering with as many local suppliers as possible.

Amarillo Gold Corporation: creating value through social and operational excellence. We are the next generation of gold production in Brazil.

A circular inset image shows a man wearing a blue hard hat with "AMARILLO" on it, safety glasses, a green long-sleeved shirt with a logo, and white work gloves. He is looking down at a piece of metal in his hands. The background is an outdoor construction site with trees and a wooden structure.

**We're not just building a mine.
WE'RE BUILDING A LEGACY.**

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door to new markets and will enhance its position as a benchmark raw materials supplier.

Also in 2020, Buritirama became the first mining company in Brazil to install a photo-

voltaic power generation system to supply 100 percent of its energy requirement, in partnership with Tesla. The new plant is scheduled for completion in mid-2021.



Buritirama sintering plant

RMB developing manganese project

RMB (Recursos Minerais do Brasil) and the Grupo Sabes holding company have signed an approximately US\$ 200 million investment agreement covering the next three

years, for the purpose of adding value to the production and processing of manganese ore. The partners aim at supplying steelmakers, agribusiness, and the special alloys industry.



Ore stack at RMB

Sustainable practices are integral to the success of our business strategy.

We are committed to minimizing environmental impacts, developing responsible mining in all locations where we operate:

- Environmental, Social, and Governance (ESG) Board Committee established and engaged;
- Partnerships with local groups;
- Environmental protection and mitigation during operations;
- Tailings and waste management strategy and oversight;
- Self assessments against the Towards Sustainable Mining protocols are in progress for each site;
- Progressive reclamation activities are carried out where possible at all sites;
- Nurseries at all sites dedicated to reintroducing local flora.



**EQUINOX
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The target is to produce 80,000 tons a month of manganese, with a Mn content of 45 percent, beginning in 2021. About 30 percent of output will be earmarked for producing manganese sulphate, an input for the fertiliser industry.

RMB will also invest in recovery of tailings, eliminating the use of dams in its projects. It intends to produce bricks, floor tiles, and pavers, using the mud from its tailings dams as the raw material.

COPPER, NICKEL, ZINC

As in the case of gold, the copper sector shows good prospects of growth in Brazil, in view of the projects now being implemented and the exploration work being done, mainly in Bahia, Mato Grosso, and Pará. In Bahia, Mineração Caraíba is making important discoveries in the Curaçá Valley, while in the Mato Grosso-Pará area, porphyry copper occurrences have been found in the Alta Floresta region, indicating a promising potential. Specialists believe this area may become a new mining frontier in Brazil for the production of copper and associated minerals.

Nickel, too, has attracted the attention of investors, largely because of the market growth to be expected with the use of nickel in electric car batteries.

Vale invests in Carajás region

Vale intends to increase its copper output capacity, and is investing heavily in this area. By 2025, the company expects to be producing 500,000 tons a year. The Salobo III project, adding between 30,000 and 40,000

tons a year to existing copper capacity, is scheduled to come on stream in 2022 following investments in the range from US\$ 570 million to US\$ 670 million. Another project in Vale's portfolio is Alemão, where



Vale's Salobo complex

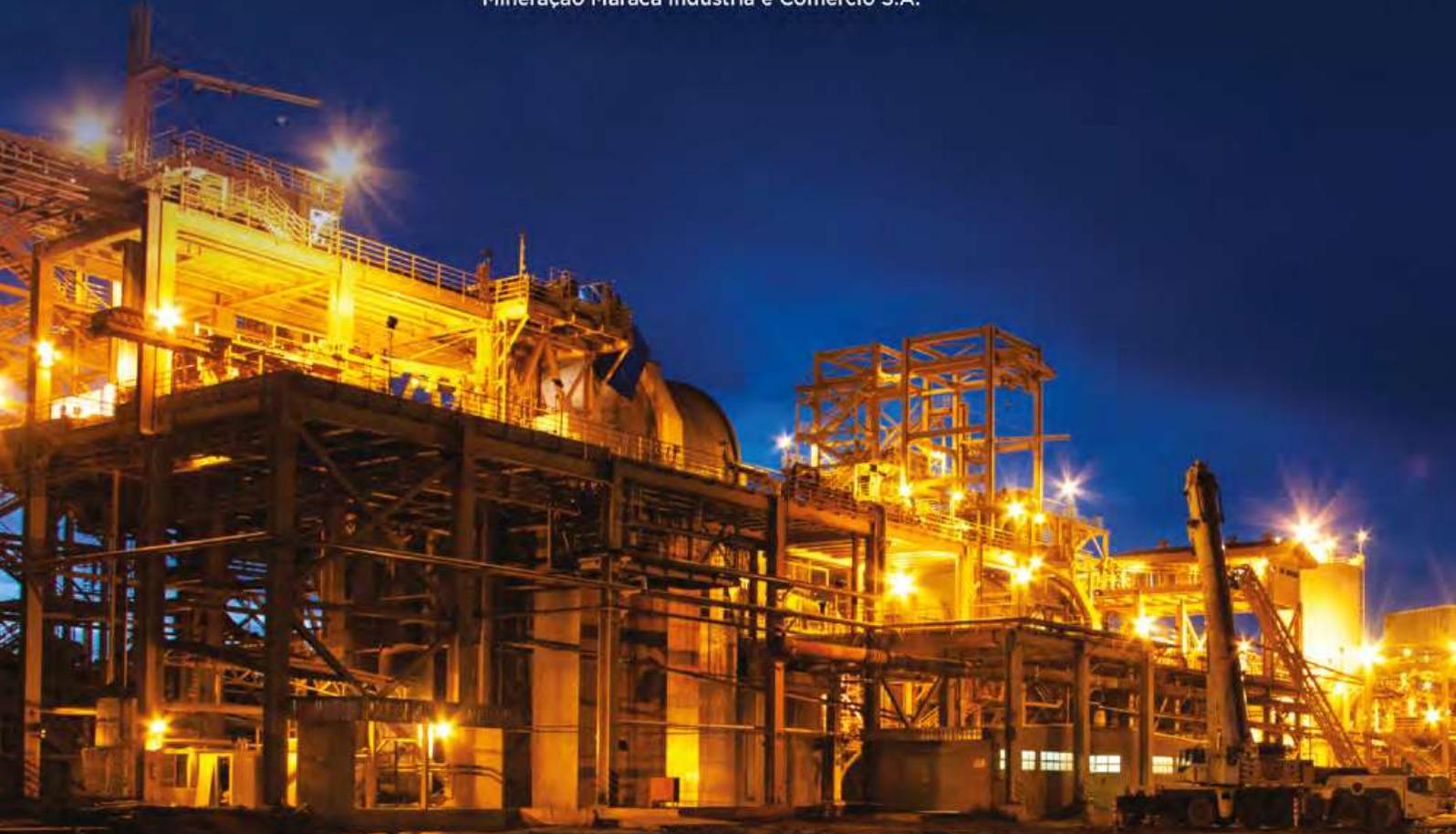
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lundin mining

Mineração Maracá Indústria e Comércio S.A.



INVESTMENTS

construction is due to begin in 2022, to be followed by startup in 2024 or 2025. Capacity will be 60,000 tons of copper a year. For the investment, Vale is considering the possibility of a streaming operation (an advance sale of gold from the mine), since the Alemão copper deposits have a high gold content. Vale's third copper project in Brazil is Cristalino, scheduled to begin producing in 2024 or 2025, which will enable the company's concentrates plant at Sossego to continue in operation. Cristalino will contribute 80,000 tons of copper per year. Vale also sees an opportunity for a further expansion at Salobo, in or around 2027, which would add a further 30,000 tons to its annual output. Looking further ahead, Vale sees potential

in what it calls its Northern Hub, comprising the deposits at Paulo Afonso, Polo, and the Furnas deposit near Salobo, which may add an output capacity in the range from 70,000 to 100,000 tons a year, by about 2030. In the Southern Hub, surface deposits lying between the Sossego and Cristalino mines are thought to offer a potential output in the 40,000 to 50,000 tons per year range. Vale also plans to take advantage of the synergy between the copper business and the iron ore side. At Cristalino, pre-stripping of the mine yielded a quantity of pellet feed which the company intends to make full use of, as also in the case of the tailings at Sossego and Salobo containing recoverable iron ore, again in the form of pellet feed.

Ero Copper grows in Bahia



Ero Copper's underground mine

Ero Copper, which operates in Brazil through the intermediary of Mineração Caraíba S.A., released for publication its Technical Report with updated figures for reserves and resources at Vale do Curaçá, in Bahia, under the Canadian disclosure rule known as NI 43-101. According to this report, underground reserves (proven and probable) add up to 27.2 million tons, with an average copper content of 1.45 percent, giving a potentially recoverable volume of 394,000 tons of copper content. These reserves are spread across three districts, Pilar, Vermelhos, and Surubim. As for the surface deposits (also the sum of proven and probable reserves) in the same three districts plus Suçuarana, the figure is 23.2 million tons having an average copper content of 0.61 percent, giving 142,000 tons of copper.

The resources (measured and indicated) that can be worked underground add up to a little over 68 million tons of ore with an average copper content of 1.39 percent, yielding a potential output of 947,900 tons. Inferred resources amount to 36.2 million tons, with a 1.05 percent copper content, equivalent to 379,800 tons of copper. This includes underground resources in the Pilar district (lower than Level 965 in the Pilar mine, plus those in the Suçuarana mine), and the resources in two other districts, Vermelhos and Surubim.

Measured and indicated resources that can be worked in an open pit amount to 36.54 million tons with a 0.60 percent copper content, meaning a possible output of 207,000 tons of copper, in addition to inferred reserves of 2.9 million tons of ore

In 2021 the company is to begin implementing a project to deepen the Pilar mine, at a cost of US\$ 65 million

with a 0.37 percent content or 10,800 tons of copper.

The same survey includes an estimate of the investments needed for exploitation of the reserves (not including the measured and indicated resources), forecasting the capex requirement at about R\$ 2.8 billion (US\$ 520 million at the present exchange rate), in addition to an operating cost of R\$ 7.5 billion (US\$ 1.4 billion). In the course of the useful lifetime of the mine, the amount of ore to be processed would be 39.4 million tons with an average 1.33 percent copper content, yielding 480,800 tons of copper in concentrates. Sales of the copper, in addition to gold and silver, the by-products from the concentrate, would suggest a sales income of R\$ 15.8 billion (almost US\$ 3 billion), assuming a copper price of US\$ 3 per pound, gold at US\$ 1,759 per ounce, and silver at US\$ 18 per ounce. These figures suggest a satisfactory rate of return on the investment and the feasibility of the venture.

INVESTMENTS

In 2021 the company is to begin implementing a project to deepen the Pilar mine, at a cost of US\$ 65 million. This includes the construction of an external shaft with a 4.5 metre diameter and 1,500 metres deep. This shaft will maximise output, the company says, adding 60 percent to productivity and affording a single conduit for the electricity and water supply, communications, and ventilation.

The MCSA Mining Complex (Mineração Caraíba) produced 42,814 tons of copper concentrate in 2020, at the upper limit of the company's output target for the year, expressed as 41,000 to 43,000 tons. For 2021,

the MCSA Mining Complex guidance for output is 42,000 to 45,000 tons of copper concentrate.

In addition, Ero Copper has its Boa Esperança project in Pará, where the most recent technical survey, conducted in 2017, showed proven and probable reserves at 19.5 million tons of ore, with a copper content of up to 0.96 percent, affording a copper output of 185,000 tons. Measured and indicated resources amount to 67 million tons of ore with a 0.73 percent content, equivalent to 490,000 tons of copper. The company is now engaged in optimising this project.

Vale Verde to start production at Serrote



Vale Verde readies Serrote project

Mineração Vale Verde (MVV), a company in the Appian Brazil Group, has now executed 95 percent of the implementation works at its Serrote project, in the state of Alagoas, scheduled to come on stream in the second half of 2021.

The company recently concluded a financing agreement in the amount of US\$ 140 million, for the purpose of finalizing the project.

MVV will produce some 20,000 tons of copper equivalent per year, from an

RHI Magnesita follows a path of sustainable developments in Brazil



RHI Magnesita is the global leader in the refractories industry and is committed to giving back and preserving the environment in its local communities.

- Sustainability: We've made commitments to the UN Global Compact and have created sustainability goals to implement by 2025, including reducing CO₂, using more sustainable energy, and improving our diversity, among others.
- Communities: In 2020, the company made R \$ 6 million (€ 902,571) in investments in social projects that promote the development of the regions where we operate, focusing on the pillars of education, youth development and environmental protection.
- Environment: over 83,000 seedlings have been generated over the last 6 years, with donations being made to communities, NGOs, employees, partners, and for the reforestation and reconstruction of more than 350 thousand square meters of soil.
- Investments: The company is investing in the construction of a new Rotary Furnace at its Brumado unit. The expectation is for a 30% increase in production, as the furnace is designed for 140,000 Tons/year. The investment was R \$ 180 million (€ 30 million).

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INVESTMENTS

open-pit mine having an expected lifetime of fourteen years. The MVV plant has the capacity to process 4.1 million tons per year.

Several important targets were met during 2020, most of them in advance of the planned date: Stage 1 of pre-stripping

concluded; a tailings storage facility built; an offtake agreement signed with an international trader; construction and assembly of a 230 kilovolt transmission line, 21 kilometres long; and construction of the main infrastructure for the processing plant.

Lundin Mining studies expansion at Maracá

Despite the covid-19 pandemic and a temporary period of inactivity occasioned by a failure in the electric power supply, in 2020 Mineração Maracá (part of the Lundin Mining group) exceeded its output guidance in both copper and gold. The power failure caused damage to the company's mills and the plant was once again able to operate at full capacity only in December 2020.

Output at the Chapada mine, in the state of Goiás, ended the year at 50,038 tons of copper (marginally above the guidance range of 45,000 to 50,000 tons), while gold output, at 87,000 ounces, also exceeded the guidance range of 80,000 to 85,000 ounces.

For 2021, the company forecasts copper output in the range from 48,000 to 53,000 tons. Lundin Mining will continue to invest in optimising production at Chapada, now equipped to process 24 million tons of ore per year, and at the same time it is examining options for a further capacity expansion to 32 million tons a year, in parallel with an aggressive exploration policy. Also in the company's plan is pre-production at Suruca, installing a pit for oxide mining and a heap-leaching plant. The estimated capital cost of the project was US\$ 57.3 million, though this figure will now have to be updated, since it was based on an estimated exchange rate of R\$ 3.60 to the dollar.



Lundin's gold mine in Goiás

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Basel Ibrahim Al Jughami
Founding President
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Horizonte Minerals eyes battery market



Site of Horizonte Minerals' Araguaia project

Horizonte Minerals has been working in Brazil for nearly ten years, in the state of Pará, with its Araguaia ferronickel project for the stainless steel market and the Vermelho nickel and cobalt project. It is now focusing particularly on the car battery market.

Its main project today is Araguaia, which has now been granted an Installation Licence and will soon begin construction work. In 2020 the company raised US\$ 20 million from Orion Mine Finance to develop this project. In exchange for its down payment, Orion will receive 2.25 percent in royalties. The contract covers the first 426,429 tons of nickel contained in ferronickel, the end product, to be produced and sold. This tonnage is equivalent to the total nickel output estimated over the whole lifetime

of the Araguaia project, as stated in the Stage 1 feasibility study.

In January 2021, the company announced that it has successfully completed the placement of 162,718,353 common shares with new investors at the price of 7.5 cents per share, obtaining approximately US\$ 25 million before expenses. The fundraising will be used to start specific works aiming at the beginning of the construction of the Araguaia ferronickel project. It is a high-grade, low-cost and long-lived asset and the feasibility study demonstrates economic robustness with the Stage 1 process plant producing 14,500 tons of nickel per year, an internal rate of return of 27%, US\$ 691 million payback over three years and a cash flow of US\$ 2.4 billion based on a nickel price of US\$ 16,400 per ton.

Atlantic Nickel to enlarge Santa Rita mine

Atlantic Nickel, controlled by the Appian group, has released a Preliminary Economic Assessment (PEA) in connection with its plan to extend operations at its Santa Rita mine, located at Itagibá in the state of Bahia, from eight to 34 years.

The new PEA indicates potential underground mining for 26 years, in addition to the eight years for the open-pit mine, giving the total lifetime of 34 years. The Santa Rita operation is to be divided into two parts. Atlantic Nickel will first exploit the open-pit mine alone up until 2028, during which period the company will boost its output capacity, estimated in the range from 20,000

to 25,000 tons per year of nickel content in concentrate.

In the second stage, an underground mine will be brought into operation with an expected lifetime of a further 26 years. According to the PEA, some US\$ 355 million will be invested in the first five years. Surveys conducted by Atlantic Nickel confirm mineral resources of 134 million tons of nickel for the underground mine (the sum of indicated and inferred resources) having a high nickel content of 0.54 percent. In this stage of the project, the company will raise its output capacity to the range from 40,000 to 45,000 tons per year of nickel content in concentrate.



Atlantic Nickel's Santa Rita mine, in Bahia

Nexa proceeds with Aripuanã implementation



Construction work at Nexa's Aripuanã project

In zinc, Nexa Resources is proceeding with the implementation of its Aripuanã project in Mato Grosso, comprising an underground mine for the extraction of polymetallic zinc and a processing plant to produce zinc, copper, silver, and gold concentrates.

Zinc output is forecast at 120,000 tons a year over a period of 13 years, on the basis of proven and probable reserves alone, estimated at 26.2 million tons. The plant will process 6,300 tons of ore per day.

Estimated output is 66,700 tons of zinc in concentrates, 23,000 tons of lead, 3,700 tons of copper, 1.87 million ounces of silver, and 13,000 ounces of gold.

Despite the pandemic, there have been no stoppages in construction work, although certain adjustments were made to the timetable and also to the planned capex, which has increased from US\$ 392 million to US\$ 547 million. All machinery is expected to be installed by the end of 2021, with startup scheduled for the first quarter of 2022.

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Information

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MINERALS OF THE FUTURE

In addition to being the world's largest niobium producer, Brazil has now also become the sole vanadium producing country in Latin America, is starting to produce lithium, and is expected to become in the near future a producer of rare earths, as the result of investments now under way.

Serra Verde to open first rare earths mine

Mineração Serra Verde has received an Installation Licence (LI) and has begun implementing its mining project, which promises to become Brazil's first world-class rare earths venture. Beginning in 2021 the company expects to contribute around 5 percent to the total world output of heavy rare earths. To develop the project through to startup, the forecast investment is US\$ 150 million, in addition to the US\$ 72

million already spent on mineral research, environmental studies, and process development. The Serra Verde deposit, located at Minaçu in the state of Goiás, holds resources in excess of 1.3 billion tons of ore having an average 0.15 percent content of total rare earths oxides (TREO). Of this total, 911 million tons have been certified in accordance with internationally accepted standards.



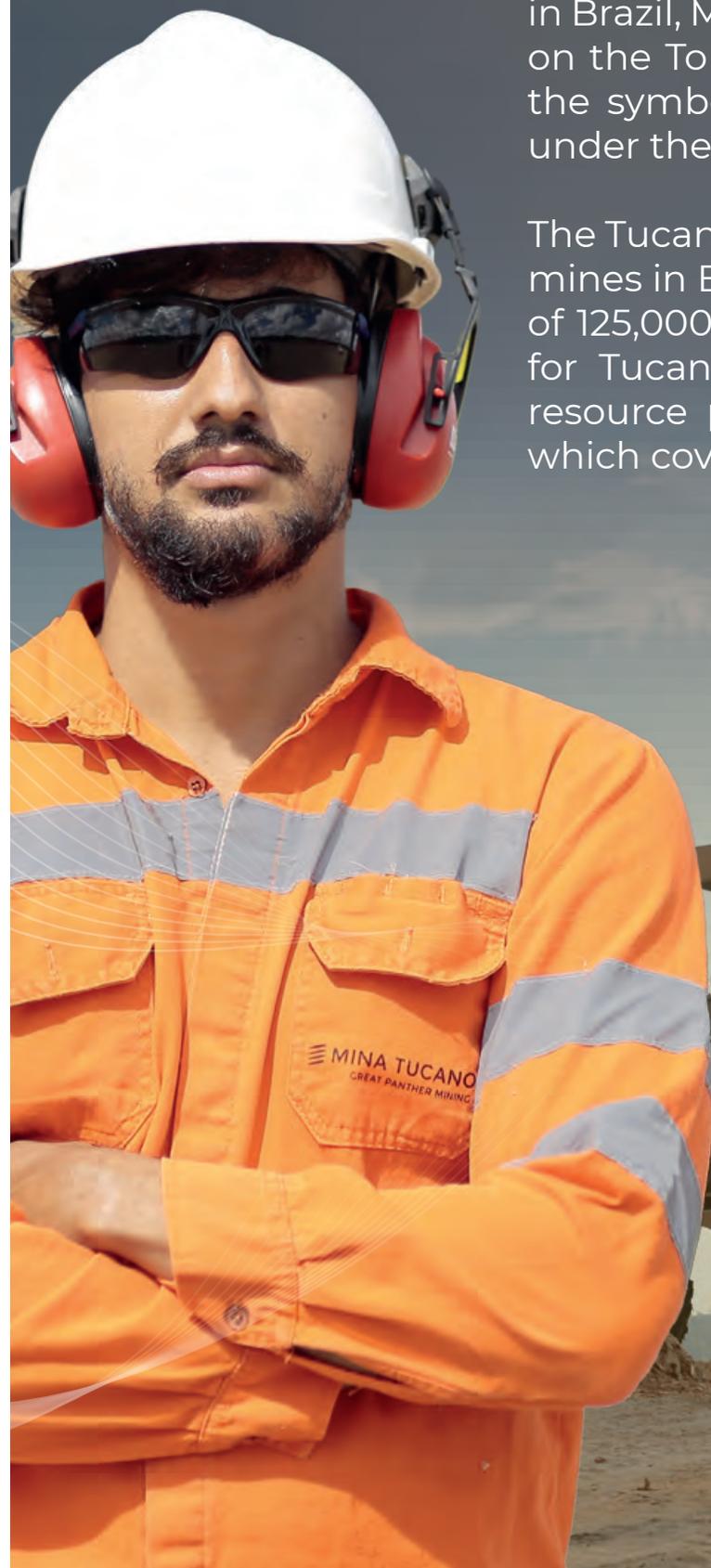
Serra Verde under construction

MINING FOR GOOD

Great Panther is a growing gold and silver producer focused on the Americas. The Company owns a diversified portfolio of assets in Brazil, Mexico and Peru. Great Panther trades on the Toronto Stock Exchange trading under the symbol GPR, and on the NYSE American under the symbol GPL.

The Tucano Gold Mine is one of the largest gold mines in Brazil with an annual gold production of 125,000 oz in 2020. Great Panther's strategy for Tucano is to explore and grow the gold resource potential of the tenement portfolio, which covers almost 2,000 square kilometres.

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AMG produces lithium from tailings



AMG's lithium plant in Minas Gerais

AMG Mineração S.A is investing US\$ 150 million in a project to boost output of lithium concentrate by recovering the metal contained in tailings held at two dams, both in disuse since 2018, in the municipalities of Nazareno and São Tiago, in Minas Gerais, where the company has a facility producing spodumene, tin, tantalum, and feldspar, in addition to lithium concentrate. AMG is today the world's leading lithium producer, contributing 23 percent of worldwide output.

This expansion will increase output capacity for lithium concentrate to 90,000

tons per year. AMG recently closed an advanced sales contract for 200,000 tons of lithium concentrate over a five-year period, giving an average 40,000 tons per year.

The project will hasten the disappearance of the two disused tailings dams and, at the same time, will make economic use of the tailings, reducing the risks. When the material now held in the dams is exhausted, the new processing plant will continue in operation, drawing supplies from the new tailings that the tantalum mining will produce.

Sigma readies Grota do Cirilo project

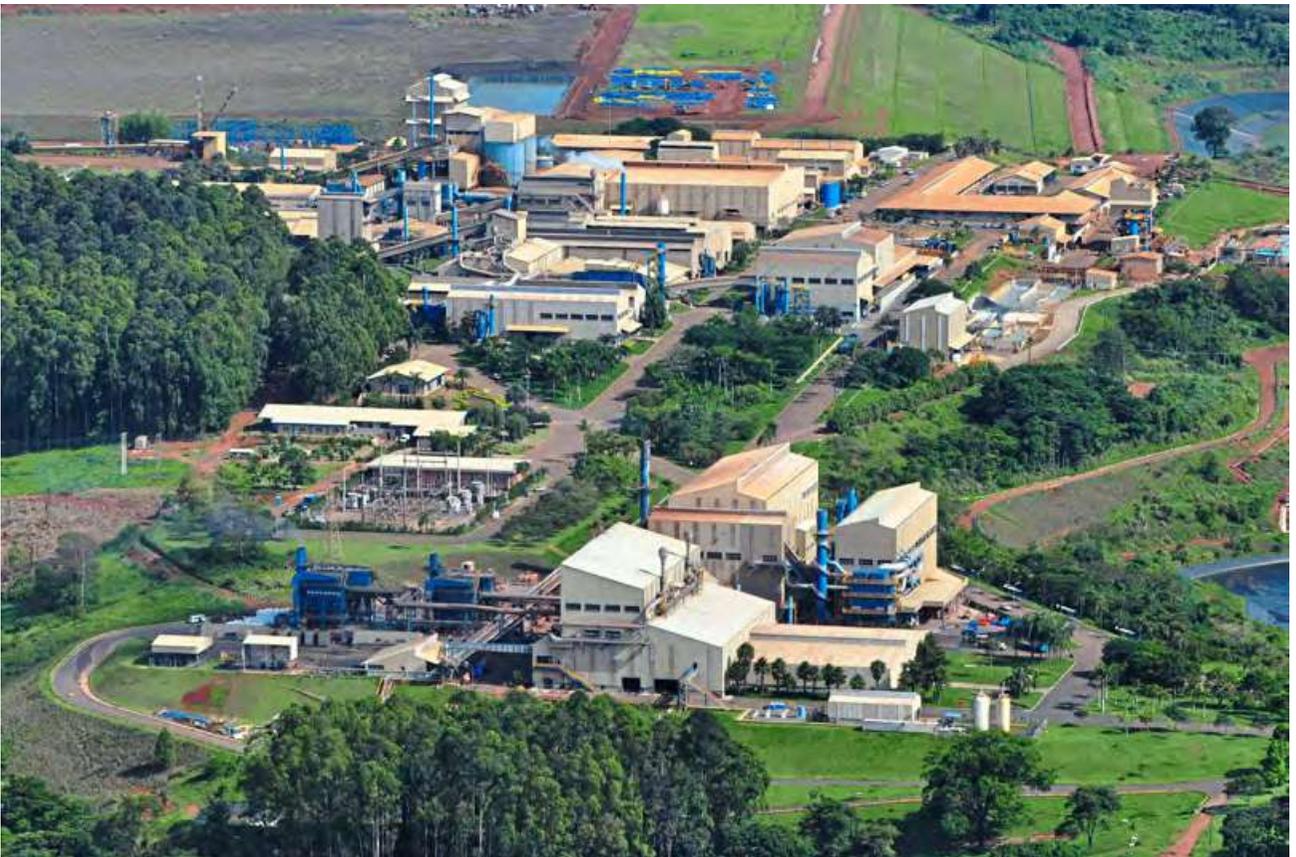
Sigma Lithium, through the intermediary of Sigma Mineração, is beginning construction at its Grota do Cirilo project, a venture with a capacity of 220,000 tons per year of spodumene concentrate, this output level to be reached in 2021. The company

holds reserves of 13.5 million tons of ore with a 1.56 percent lithium oxide content, at the Xuxa mine in the municipalities of Araçuaí and Itinga, in the Jequitinhonha River valley in Minas Gerais. The venture is budgeted at US\$ 65 million.



Sigma Lithium's Grota do Cirilo project

CBMM boosts niobium output



CBMM's ferroniobium complex

INVESTMENTS

In niobium, CBMM (Companhia Brasileira de Metalurgia e Mineração) is concluding implementation of a project to expand its ferroniobium output capacity to 150,000 tons per year, already in 2021. This will be a 50 percent increase above its earlier capacity. The expansion program involved investments of around US\$ 200 million, including capacity expansion at the plant and marketing and sales actions

to enlarge the niobium market. Among these actions, an alliance has been formed with Toshiba and Sojitz Corp. to develop lithium batteries with mixed niobium and titanium anodes. Under an investment budget of US\$ 7.2 million, CBMM will install a pilot production line for a new generation of batteries, in which the differential is high energy density and rapid charging.

Largo Resources invests in expansion



Largo Resources' vanadium plant

Largo Resources, Latin America's sole vanadium mining company, is investing US\$ 10 million in a new unit to be built in 2021, where it will produce V₂O₃ (high-purity vanadium oxide), widely used in the aerospace industry. This will be a further step in the company's plan to boost sales of high-purity products, to a point where they will account for 70 percent of all sales.

Largo Resources Ltd. reports that the Maracás Menchen mine exceed its output and sales target for 2020, by a margin of 260 tons of vanadium. In 2020, Largo introduced new sales and marketing operations, began construction work at its planned V₂O₃ plant, and launched Largo Clean Energy, amidst the global pandemic.

Largo's expectation is that in 2021 it will expand its V₂O₅ sales to the range from 12,250 to 12,750 tons, which would mean a 22 percent increase over 2020. The company plans to issue an updated technical report at the end of the first quarter of 2021, with new, larger tonnages for known resources and incorporating the V₂O₃ plant, in addition to projects for producing titanium dioxide (TiO₂) pigments.

With the addition of Largo Clean Energy, in December 2020, the company is working to develop its clean energy storage business in 2021, to supply safe and sustainable vanadium redox flux batteries (VRFB) to the rapidly growing renewable energy market.

Taboca invests in niobium, tantalum, and rare earths



Metallurgy unit at Mineração Taboca

Mineração Taboca, controlled by the Minsur group of Peru, is implementing a strategic plan aimed at extending its product range, adding higher value-added items and maximising the exploitation of its polymetallic deposit in the municipality of Presidente Figueiredo, in Amazonas, where the main product, in volume terms, is tin, but which also holds niobium, tantalum, and other metals that it is beginning to exploit.

This plan, in which the company has invested some US\$ 150 million so far, is split into four stages, of which the first two have already been completed: Stage 1, stabilizing output, and Stage 2, improving productivity, both by increasing recovery rates in the processing plants and making processes more

INVESTMENTS

efficient. The company is now engaged in implementing Stage 3, which calls for building and installing a pilot plant to upgrade the niobium and tantalum concentrates, obtaining higher quality metallic products and developing new ferroniobium and tantalum alloys, enabling the company to improve its market position. Stage 4, recovering the rare earths contained in the slag from niobium and tantalum metallurgy, will possibly also include the exploration of a cryolite deposit, a mineral used in the aluminium industry and in the production of hydrofluoric acid.

Recovering by-products has enabled Taboca to achieve a remarkable increase in

sales income in recent years. From R\$ 584 million in 2017, sales rose to R\$ 734 million in 2018. In 2020, even after a month-long stoppage to introduce preventive measures against the Covid-19 pandemic, sales grew to R\$ 753 million. Taboca has also distinguished itself in combating the pandemic and in the procedures adopted for the health and safety of its employees (1,449 in direct employment and 1,200 outsourced), enabling it to become the only mining company in Brazil to be awarded the Vanzolini Foundation's certificate of a safe working environment in terms of the risk of contamination by the coronavirus.

Terra Goyana pursues vertical integration



Terra Goyana's laboratory in Goiás

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INVESTMENTS

Terra Goyana Mineração (TGM), which began producing bauxite as recently as 2013, has now become an important player in the industry. It is investing in the vertical integration of production and in new product development, having achieved significant growth in sales income in the last three years. It currently produces 1.3 million tons of bauxite at a deposit it holds in Barro Alto, in Goiás, including tonnages produced for other companies under outsourcing arrangements. In 2020 about 40 percent of this output was sold to industrial users, while the 60 percent balance was metallurgical bauxite for aluminium production. This same proportion will probably be repeated in 2021, when output volume may grow to as much as 1.8 million tons.

A key factor in the vertical integration strategy has been the partnership with Bautek, which possesses expertise in the production of various kinds of bauxite for industrial use and for clay minerals. At the beginning of 2020, TGM opened a laboratory in Goiás, both for quality control and for new product development, for an investment of around US\$ 2 million. This laboratory has played a fundamental role in the company's vertical integration policy. Now that the laboratory is fully consolidated in terms of quality control of the raw

materials supplied to the market, the focus will now shift to R&D, developing new bauxite products for industrial use.

The company also intends to extend its activity on the world market, since for certain applications the bauxite mined at Barro Alto is unique. In the early weeks of 2021, export contracts were signed for shipment to Russia and France, with the prospect of other deals to be concluded shortly with clients in the United States, Indonesia, and Austria.

In addition to bauxite, TGM has sought to diversify its mineral exploration activities, with the aim of opening new production alternatives. Gold is a case in point. The company holds the rights to three areas which it now exploring, two in the Tapajós region and the third in the state of Tocantins. In Tapajós, the main project is Pau d'Arco, in an area having significant occurrences of gold in association with copper. In this area, the company is beginning an exploration project with the focus on geophysics, with soundings to be left to a possible later stage. Also in the Tapajós province, the Palmares project is highly promising, though still only at a very early stage of exploration. Finally, TGM has a project at Natividade in the state of Tocantins, where geophysical surveys are now under way for a fuller assessment of the deposit. □



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Contact Dr Ana-Lucia Frezzatti Santiago on +55 11 972889011 or +55 11 50878872 or ana.santiago@voconiq.com to discuss how this unique approach can provide the engagement insights you need.

THE 100 LARGEST MINING COMPANIES IN BRAZIL

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
1	Vale S/A	Iron ore	23	0.45692
2	Minerações Brasileiras Reunidas S/A	Iron ore	5	0.05427
3	Anglo American Minério de Ferro Brasil S/A	Iron ore	2	0.04906
4	CSN Mineração S/A	Iron ore and dolomite	2	0.04404
5	Salobo Metais S/A	Copper	1	0.03726
6	Kinross Brasil Mineração S/A	Gold	1	0.02204
7	Anglogold Ashanti Córrego do Sítio Mineração S/A	Gold	6	0.01321
8	Mineração Usiminas S/A	Iron ore	2	0.01176
9	Mineração Maracá Indústria e Comércio S/A	Copper and Gold	3	0.00936
10	Vallourec Tubos do Brasil Ltda.	Iron ore	1	0.00904
11	Mineração Rio do Norte S/A	Bauxite	1	0.00891
12	Baovale Mineração S/A	Iron ore	1	0.00812
13	Jacobina Mineração e Comércio Ltda	Gold	1	0.00731

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THE LARGEST

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
14	Mineração Paragominas S/A	Bauxite	1	0.00636
15	Mineração Caraiba S/A	Copper	6	0.00607
16	Ferro + Mineração S/A	Iron ore	1	0.00565
17	Mineração Aurizona S/A	Gold	2	0.00543
18	Alcoa World Alumina Brasil Ltda.	Bauxite	3	0.00541
19	Mina Tucano Ltda.	Gold	1	0.00531
20	Ferrous Resources do Brasil S/A	Iron ore	1	0.00499
21	Mineração Serra Grande S/A	Gold	4	0.00473
22	Extrativa Mineral Ltda	Iron ore	1	0.00427
23	Votorantim Cimentos S/A	Limestone	61	0.00413
24	Mosaic Fertilizantes Ltda	Phosphate and Potassium	4	0.00408
25	Mineração Serras do Oeste Eireli	Gold	2	0.00379
26	Anglo American Níquel Brasil Ltda.	Nickel	2	0.00374
27	Mineração Corumbaense Reunida S/A	Iron ore	2	0.00358

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
28	Nexa Recursos Minerais S/A	Zinc	8	0.00334
29	Mineração Riacho dos Machados Ltda.	Gold	1	0.00289
30	Arcelormittal Brasil S/A	Iron ore	2	0.00281
31	Niobras Mineração Ltda	Nióbio	2	0.00280
32	Mineração Apoená S/A	Gold	4	0.00274
33	Fazenda Brasileiro Desenvolvimento Mineral Ltda	Gold	2	0.00264
34	Gerdau Açominas S/A	Iron ore	2	0.00261
35	Mineração Conemp Ltda.	Iron ore	2	0.00257
36	JMN Mineração S/A	Iron ore	1	0.00238
37	Atlantic Nickel	Nickel	9	0.00233
38	Mineração Taboca S/A	Tin, niobium and Tantalum	1	0.00190
39	Imerys Rio Capim Caulim S/A	China Clay	2	0.00178
40	Minerita Minérios Itaúna Ltda.	Iron ore	2	0.00171
41	Mineração Baratinha S/A	Iron ore	1	0.00157

THE LARGEST

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
42	Itaminas Comércio de Minérios S/A	Iron ore	3	0.00157
43	Mineração Comisa Ltda	Iron ore	2	0.00154
44	Pilar de Goiás Desenvolvimento Mineral S/A	Gold	2	0.00150
45	Salinas Gold Mineração Ltda	Gold	12	0.00146
46	Companhia Brasileira de Metalurgia e Mineração	Niobium	2	0.00141
47	NX Gold S/A	Gold	2	0.00136
48	AVB Mineração Ltda	Copper and Gold	1	0.00130
49	Nacional de Grafite Ltda	Graphite	7	0.00126
50	Mineração Vale do Jacurici S/A	Chromite	1	0.00125
51	Serabi Mineração S/A	Gold	8	0.00123
52	Cia de Mineração Serra da Farofa	Iron ore	3	0.00116
53	Gana Gold Mineração Ltda	Gold	1	0.00112
54	Ferromar Indústria e Comércio S/A	Iron ore	1	0.00112
55	Lafargeholcim (Brasil) S/A	Gneiss	28	0.00110



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THE LARGEST

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
56	Copelmi Mineração Ltda	Coal	10	0.00106
57	White Solder Metalurgia e Mineração LTDA	Tin	15	0.00105
58	Cadam S/A	China Clay	1	0.00099
59	Mineração Jundu Ltda.	Quartz Sand	12	0.00095
60	GICS Indústria Comércio e Serviços S/A	Clay and Basalt	5	0.00094
61	Mineral do Brasil Ltda.	Iron ore	10	0.00092
62	Embu S/A Engenharia e Comércio	Granyte, Sand and Clay	4	0.00090
63	Polimix Concreto Ltda	Limestone and Philito	13	0.00085
64	Minérios Nacional S/A	Iron ore	1	0.00084
65	Sama S/A Minerações Associadas	Asbestos	1	0.00083
66	Indústria Carbonífera Rio Deserto Ltda	Coal	3	0.00082
67	MBL Materiais Básicos Ltda	Iron ore	3	0.00082
68	Tronox Pigmentos do Brasil S/A	Rutile, Ilmenite and Zirconite	1	0.00079

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
69	Carbonifera Metropolitana S/A	Coal	2	0.00077
70	MML Metais Mineração Ltda	Iron ore	2	0.00068
71	Vanádio de Maracás S/A	Vanadium	1	0.00068
72	Intercement Brasil S/A	Clay and Dolomite limestone	16	0.00067
73	AVG Empreendimentos Minerários S/A	Iron ore	5	0.00067
74	Mineração Belocal Ltda	Limestone	7	0.00066
75	SAFM Mineração Ltda	Iron ore and manganese	1	0.00065
76	Para Pigmentos S/A	China Clay	1	0.00059
77	AMG Mineração S/A	Lithium, Tantalum and Feldspar	1	0.00058
78	MSM Mineração Serra da Moeda Ltda.	Iron ore, manganese and clay	1	0.00054
79	MMX Corumbá Mineração S/A	Iron ore	1	0.00051
80	Xilolite S/A	Dolomite, Limestone and talc	1	0.00050

THE LARGEST

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
81	Ciplan Cimento Planalto S/A	Clay and Limestone	5	0.00050
82	Guidoni Ornamental Rocks Ltda	Granyte	12	0.00046
83	Companhia Brasileira de Alumínio	Bauxite	9	0.00044
84	Lipari Mineração Ltda	Diamond	2	0.00043
85	Copacel Indústria e Comércio de Calcário e Cereais Ltda	Limestone	2	0.00042
86	Cooperativa de Garimpeiros de Ourilandia e Região	Gold	1	0.00042
87	Magnesita Mineração S/A	Magnesite	8	0.00042
88	Mineração Bodoquena S/A	Limestone	1	0.00042
89	Companhia Riograndense de Mineração	Coal	4	0.00041
90	Mineração Ferro Puro Ltda	Iron ore	2	0.00041
91	Caltins Calcário Tocantins Ltda	Limestone	3	0.00040
92	Paupedra Pedreiras Pavimentacoes e Construções Ltda	Granyte and Feldspar	1	0.00039
93	Mineração Tabipora Ltda	Gold	1	0.00038

RANKING	COMPANY	PRODUCT	NUMBER OF OPERATIONS	SHARE IN OUTPUT VALUE
94	Vermont Mineração Exportação e Importação Ltda.	Granyte	6	0.00038
95	Geocal Mineração Ltda	Philito, quartz and dolomite	2	0.00036
96	Construtora Martins Lanna Ltda	Granyte	2	0.00034
97	Buritirama Mineração S/A	Manganese	1	0.00034
98	Serra Leste Mineração Ltda	Iron ore	1	0.00034
99	Copebras Indústria Ltda	Phosphate	2	0.00033
100	Mineração de Calcário Montividiu Ltda	Limestone	7	0.00032

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Launching ceremony of the Mining and Development Program

THE GOVERNMENT'S PRIORITIES FOR DEVELOPING THE INDUSTRY

Francisco Alves and Mara Fornari

Executing the Mining and Development Program (PMD) launched in 2020, which set out 110 targets and ten plans: this is the priority for 2021, says Alexandre Vidigal, secretary for Geology, Mining, and Mineral Transformation (SGM) in the Mining and Energy Ministry. “We see mining as a means for furthering Brazil’s development,” he says. “That’s what differentiates this program. It views mining as an important instrument for developing the Brazilian economy.”

Apart from the priority status of the PMD, Vidigal’s secretariat has listed several other actions on its policy agenda for the mining industry, with prominence given to restructuring and reorganising the National

Mining Agency (ANM), enabling it to provide its services efficiently and effectively. “At this moment,” Vidigal notes, “there is a backlog of over 200,000 applications awaiting processing or an answer. To help with this task, electronic processing has already been installed, to replace the paperwork.”

Another priority will be no longer to regard the Brazilian mining industry as a mere producer of mineral commodities and industrial inputs. “We need to change that culture and that view of the mining industry’s place in the economy,” Vidigal says. “We need to learn to value the importance of the mineral transformation industry. Brazil has lost a great deal of space in the world economy because of its own

historical trajectory, which didn't allow it to achieve a higher level of industrialisation, in relation to industrial standards prevailing at the time. We are now taking an active part in the process of energy transition, and we have the inputs that society and the world both need. We have the capability of becoming protagonists, as well, in this transformation of industry, and cease to be a mere supplier of important minerals. We have here, within our borders, an industry that is going to move the world."

Building on the foundation of its mining industry, Vidigal says, Brazil can become an exporter of electronic components, such as batteries. "Now is the time to start thinking about this," he says. "Some companies, fully aware of this opportunity, already have large-scale projects in hand for the technological development of niobium and lithium." In fact, the SGM has several minerals of strategic importance in its sights for this year: niobium, lithium, and rare earths, as well as the development of graphene technology.

Brazil also needs to reduce its dependence on imports of raw materials for fertilisers, to supply the agribusiness market, Vidigal says. Today, Brazil imports around half of the phosphate it consumes and more than 90 percent of the potassium. "Brazil needs to produce these inputs itself," he says, "and it needs to have a clearly defined policy for this area."

Another focal point is to promote legal mining, which means, in Vidigal's own words, "Mining and legality joined together, in a licit activity. This theme is already on the global agenda in the context of sustain-

nability. If we deal with mining from the viewpoint of its licitness, naturally we'll be dealing with the socio-economic aspects, the environmental aspects, and concern for future generations. Instead of speaking only about sustainability, the SGM wants to talk about licit mining, encompassing the necessary confrontations and developments. We are working on specific actions, and we are confident that, by following this path, we will give Brazil a much improved mining industry."

We have here, within our borders, an industry that is going to move the world

In a joint action with the National Mining Agency and the Geological Service of Brazil (SGB-CPRM), Vidigal's secretariat is seeking ways to put in place a unified data bank on mining in Brazil, since, in his own words, "The information is fragmented to such an extent that it puts too many obstacles in the way of developing the mining industry. The CPRM is highly advanced in information technology, since it has installed all the equipment and software that leave nothing to be desired in comparison with the world's best in its area, and for that reason, it will act to centralise these efforts," Vidigal says, promising that a formal agreement unifying the three data systems will be announced shortly.



Alexandre Vidigal

WE INTRODUCED THE ONLINE ACKNOWLEDGMENT, A FIRST STEP TOWARDS A FULLY ONLINE APPLICATION PROCEDURE, AND WE ALSO INTRODUCED ONLINE APPLICATIONS FOR MINERAL SURVEY

Dam safety and the National Mining Agency

Since 2019, Vidigal says, the government has been closely involved in the question of tailings dams and operating safety. This has made great demands on his Secretariat and led to the enactment of “very modern” legislation, which gained congressional approval at the end of 2020. “In fact, at the beginning of 2020 our expectation in the Secretariat had been that we’d be able to advance in the question of dam safety, leaving until later our efforts on what the government’s agenda would be for the mining industry. In a way, that plan was put into execution in 2020. The talks that had begun in the previous year culminated in the Mining and Development Plan (PMD), setting out an agenda for the mining industry up until 2023.”

But before the end of 2020, the Secretariat had work to do on other advances, such

as setting up the National Mining Agency, which, although it was then still very new, in Vidigal’s words, “had been born with great difficulty and totally unstructured, with shortcomings in the services it was supposed to provide.”

In other words, in parallel with its Agenda 2023, the SGM also devoted itself to improving working conditions at the ANM and thus make an advance in the foremost commitment of the Regulatory Agenda. As Vidigal sees it, much was achieved. “We introduced the online acknowledgment, a first step towards a fully online application procedure, and we also introduced online applications for mineral survey. The AGM’s agenda was made available to the public. Last year it addressed the question of the recovery of tailings and residues; the certification of resources and reserves; the new organization model for mineral substances; mine closures; and collateral for financing operations.”

In 2020, the SGM both began and concluded important steps in the Regulatory

Agenda. Apart from advances in industry standards, such as the new Law 14066/20 regulating the construction and use of dams, superseding the earlier legislation enacted in 2008, the Secretariat also celebrated an amendment to Law 13795, broadening the entitlement to the special licensing regime, adding minerals such as limestone, clays, and ornamental rocks.

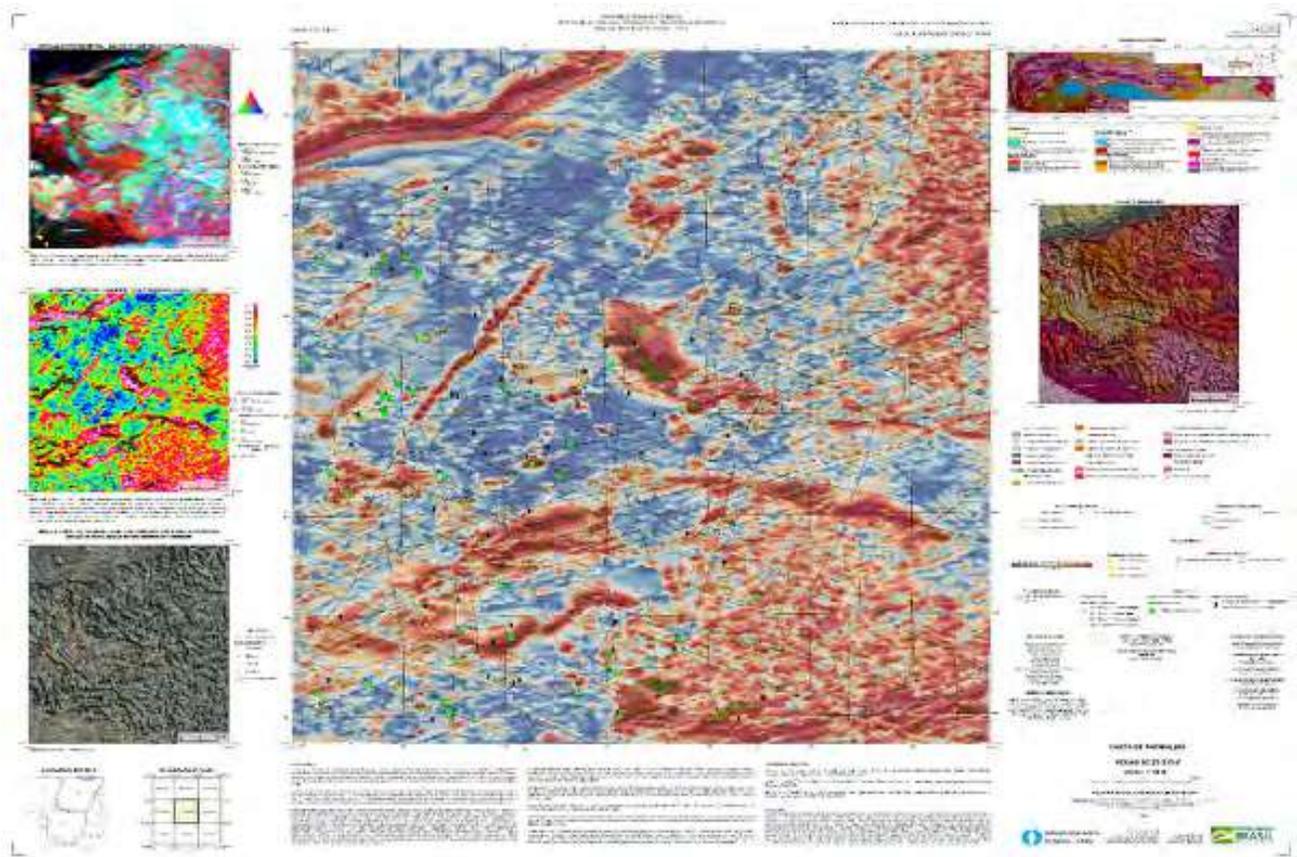
On the question of governance, with specific reference to the PMD Agenda and enhancing public awareness of mining policy, Vidigal is confident there have also been advances. “We issued PL 191/20, which addresses the question of mining in indigenous areas, we worked on the question of Decree 8384, dealing with remineralisers (minerals that can be used as soil remineralisers), which is due for publication soon. We also sought to advance in the question of caves, in which Brazil has a reality that is unique in the world, and we need to bring this question up for discussion. In other words, it was a pretty intensive year,” he says, without even taking into consideration the worldwide crisis arising from the Covid-19 pandemic.

Vidigal also celebrates the fact that the Brazilian mining industry reported strong growth and good results in 2020. “The results show remarkable advances in a year of difficulties, such as the crises that hit the automobile industry and makers of white line appliances, both large-scale consumers of mineral inputs. The Brazilian government decided to classify mining as an essential activity, something that other governments, such as those of Chile and Peru, did not do, with the result that they

paralysed their mining activities. In Brazil, the industry was enabled to remain in operation, while taking the necessary measures to ensure workers’ safety, in accordance with strict rules that comply with international recommendations for maintaining activities during the pandemic,” he notes. He celebrates the fact that investments in the industry now forecast for the 2020-2024 period are up at the US\$ 38 billion level, an increase of no less than 40 percent over the figure for the preceding five-year period, and more than double the amount forecast for 2018-2022.

Vidigal also mentions the auctions successfully held by both CPRM and the ANM. Two CPRM’s biddings will be held in June 2021, while the SGM has now drawn up a full timetable for every area, under which the ANM’s ninth auction is to take place in May 2022. “These are impressive numbers,” Vidigal comments. “But we clearly still have many problems to solve, such as the infrastructure for the ANM, which is up against a very tough budgetary scenario, though that hasn’t brought work to a standstill,” he points out, adding that the Agency is now about to hold a competitive examination to fill forty vacancies for dam inspectors. □

THE RESULTS SHOW REMARKABLE ADVANCES IN A YEAR OF DIFFICULTIES, SUCH AS THE CRISES THAT HIT THE AUTOMOBILE INDUSTRY AND MAKERS OF WHITE LINE APPLIANCES, BOTH LARGE-SCALE CONSUMERS OF MINERAL INPUTS



GEOLOGICAL SERVICE TO SPEED UP AUCTIONS AND EXTEND MAPPING

Francisco Alves

The Geological Service of Brazil (SGB-CPRM) intends to speed up its program for auctioning mining rights to assets in its portfolio, adding up to more than 300 sites, mostly coalfields though also including a variety of mineral deposits. These auctioning procedures are being conducted under the federal government's Program for Investment Partnerships (PPI), coordinated by the Special Secretariat for the PPI.

In 2020 the Service successfully held its first auction, for a polymetallic deposit holding zinc, lead, copper, cadmium, gold, and silver, covering an area of 6,050 hectares in the municipality of Palmeirópolis in the state of Tocantins. The successful bidder was the Australian company Perth Recursos Minerais, which offered royalties of 1.71 percent in the production phase and a bonus of R\$ 15 million, to be paid in three instalments. Esteves Colnago, the president

of the SGB-CPRM, says the expected investment in the venture amounts to R\$ 255 million, creating 2,500 jobs.

There was little competitive bidding at the auction, which Colnago attributes to the fact that this was the first auction of its kind, and that the market is not yet accustomed to business deals of this kind (SGB-CPRM offering areas under its direct control). “But the auction was successful,” Colnago recalls. “One company was interested, it took the area, and now it is starting its complementary research on the spot. Other companies have shown interest in several products that CPRM has in its portfolio,” he says, adding that, in 2021, the SGB-CPRM, acting jointly with the Program for Investment Partnerships, expects to put up for auction at least six more areas: Rio Capim (china clay), Bom Jardim (copper), Miriri (phosphate), Santo Inácio (diamonds), Rio Cupari (gypsite), and Aveiro (limestone). Two additional areas are listed for economic assessment to be carried out this year (nickel and cobalt at Morro do Engenho and Santa Fé) with a view to readying new auctions.

An important change has been announced for this new phase, says Márcio Remédio, the director of geology at SGB-CPRM: the down payment described as a bonus will be cut from 10 percent to 2.5 percent, reducing the successful bidder’s initial outlay. In exchange, the company will be required to conduct more extensive complementary research.

Remédio explains that full information about each project is available on the website operated by the Geological Service jointly with the PPI, and that prospective



Esteves Colnago

bidders will be able to visit the mineral samples collection. Private meetings may also be arranged to clear up any doubts.

The SGB-CPRM is also engaged in extending geological knowledge of Brazil’s territory under the Mining and Development Program (PMD), recently launched by the Mining and Energy Ministry. The targets set up by the Geological Service include:

- Increase the number of geological, geophysical, and geochemical surveys.
- Encourage prospecting and geological research in the case of minerals considered priorities for the national interest.
- Provide incentives to mineral research companies.
- Improve geological knowledge of sedimentary basins in Brazil.
- Improve geological knowledge of Brazil’s continental shelf.
- Pursue the formulation, widening, and diversification of RD&I (Research, De-

velopment, and Innovation) projects in the areas of earth sciences and mineral research.

- Extend agro-geological zoning and integrate all soil and geological data.
- Modernise SGB-CPRM's technological resources.
- Extend technological and professional training of SGB-CPRM personnel.
- Seek technological and information exchange programs with geological services in other countries, with a view to improving and modernising the Geological Service of Brazil, and to make public the resulting benefits.
- Unify the data banks operated by the National Mining Agency and the SGB-CPRM.
- Reorganise all information and records of geological research conducted in Brazil.

The task of geological mapping will be carried in harmony with companies' own activities. Thus, one of the priority regions at the moment is the Juruena-Teles Pires province, where major companies are carrying out mineral exploration programs.

The Service is also engaged in unifying its data bank with that of the ANM, so that investors will find all the available information in one place. This includes geological surveys conducted by SGB-CPRM itself, and also those conducted by the private sector in their exploration activities. Making this data available online "will give compa-



Márcio Remédio

nies quick and easy access to all available information. This data bank will assemble information from all over the country, which is very important," says Colnago. He adds that in the last few years SGB-CPRM has done much to facilitate the handling of data and information.

All the information held by the Geological Service is already being made available, Remédio says. "We have the Geobank, that can be accessed and from which vector files, maps, images, etc., can be downloaded. And now we are modernising it and investing in it to make life easier for whoever visits our site." Among the wealth of information, he highlights the Maps of Anomalies program, which was begun in March 2020 and by December of the same year had published all 82 existing maps on the scale of 1:100,000. The products that were made available were PDF maps and existing vector files for each of the sheets. In just over a month following the product launch there were over 1,690 downloads of these sheets.

In 2021, he says, similar maps of anomalies on the scale of 1:100,000 will be made available for other mineral provinces. The regions scheduled for inclusion this year are Rondônia, Amapá and Rio Maria-Pará, adding up to over 60 new maps.

Remédio says the work programme for 2021 calls for geological mapping of 53 cartographical sheets at different stages of the mapping process, adding up to a total area of 150,000 square kilometres.

Colnago notes that SGB-CPRM is focusing on those areas that show signs of having the greatest potential in terms of mining, such as the Iron Quadrangle in Minas Gerais, the Carajás province, the south of Pará, Amazonas, and the north of Mato Grosso. In other words, “we are concentrating our actions in those places, where preliminary indications exist and where the potential is greatest,” he says, stressing that aero-geophysical work still needs to be done in order to have a clearer understanding of the full potential of these little-known areas.

SGB-CPRM is also making advances, Colnago and Remédio say, in partnerships with private enterprise, “aiming, above all, at encouraging sustainable mining by promoting mineral processing technologies and the reuse of tailings, with the focus on the principles of mining efficiency, as in the case of the cooperation agreement signed with Anglo American Nickel.” This partnership, which also includes DERA of Germany, concerns the processing of tail-

ings from nickel mining for the recovery, through a leaching process, of the cobalt contained in lateritic nickel deposits. Another partnership, now being finalised, will be signed with Vale, and will have as its purpose enlarging the mineral potential and identifying new ore reserves at Carajás.

Another of SGB-CPRM’s priorities is marine geology, intensifying surveys of what has come to be known as the Blue Amazonia, meaning Brazil’s exclusive economic zone and continental shelf, which hold a large number of mineral resources such as oil and natural gas, as well as the potential for carbonatite, phosphate, diamonds, iron, manganese, cobalt, platinum, nickel, and rare earth elements (thallium and tellurium). Brazil is pressing for the enlargement of this area from the present 3.5 million square kilometres to 5.5 million square kilometres, which would practically correspond to a new Amazonia, which measures 5.0 million square kilometres. And it is SGB-CPRM’s activities that are making this possible.

The Service also intends to expand its activities in the field of science and technology by establishing partnerships with universities and research centres. “Sometimes we lack the appropriate technical personnel to develop certain opportunities, and a university always has them,” Colnago says. “We want to bring these qualified specialists together to work on projects that we need to develop, projects that are also of interest to the universities.” □

“WE ARE CONCENTRATING OUR ACTIONS IN THOSE PLACES, WHERE PRELIMINARY INDICATIONS EXIST AND WHERE THE POTENTIAL IS GREATEST,”

IBRAM SEES ATTRACTIVE BUSINESS ENVIRONMENT

Francisco Alves



THE NATIONAL MINING AGENCY HAS ALSO IMPROVED THE QUALITY OF REGULATION IN THE MINING SECTOR, WHICH IS HIGHLY FAVOURABLE TO INVESTMENTS

FLÁVIO PENIDO

Judging by the statistics, this a favourable moment for investing in the Brazilian mining industry. This is the view of Ibram, the Brazilian Mining Institute, which calculates a total of US\$ 38 billion for the 2020-2024 period. Flávio Penido, the executive president of the Institute, notes that, “Apart from expansion projects, the availability of areas for research has leapt ahead, attracting the attention of investors and entrepreneurs. The National Mining Agency has also improved the quality of regulation in the mining sector, which is highly favourable to investments.”

To make the business environment still more attractive, Penido says Ibram has opened talks with prospective partners in Brazil and around the world. One example is the partnership agreement with the Toronto Stock Exchange (TSX) and the TSX Venture Exchange (TSXV), which aims at boosting investment in the Brazilian mining industry, “with all the transparency and security that capital markets demand around the world.”

On the political level, he says, Brazil is going through a period of renewal of its economic and financial policies. “So much

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IX SIMPÓSIO BRASILEIRO
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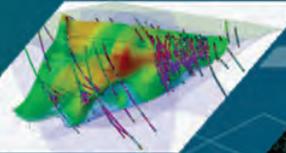
IX BRAZILIAN SYMPOSIUM
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so, that a few months ago Brazil approved the reform of the social security laws and made changes to the labour laws to facilitate job creation and to lower the cost of employability. Other wide-ranging structural reforms are on their way, to be discussed by the nation, which will certainly have a positive impact on Brazil's business environment."

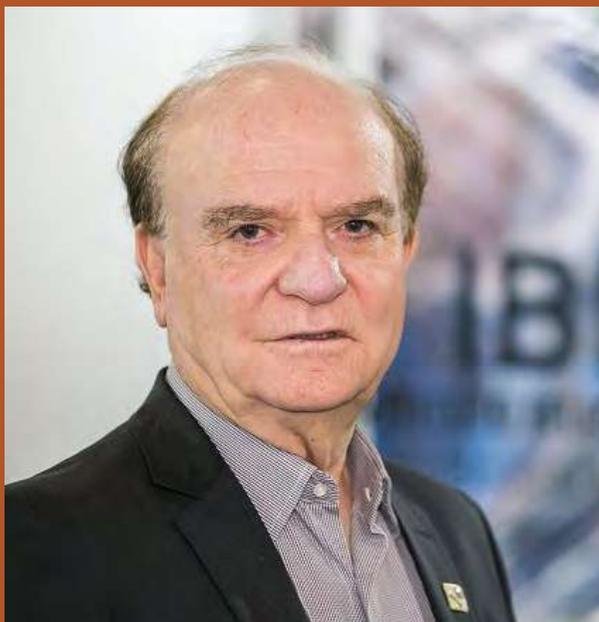
PMD aims

Commenting on the recently launched Mining and Development Plan (PMD), Penido says, "The federal government has made very clear its attitude towards mining: it wants sustainable mining to be a pillar of Brazil's social and economic development. In other words, it wants to foster the expansion of mining." He praised a presidential decree that included mining among six economic areas now brought together under the Integrated Long-term Infrastructure Plan.

Penido says of the PMD, which sets quantitative and qualitative aims for the expansion of mining: "The targets fully meet the expectations of the mining industry. This plan defines the government's agenda for mining and lists 110 clearly defined targets, as well as actions in ten specific areas of the industry, for the 2020-2023 period. The program addresses questions of mining economics, sustainability, geological research, mineral exploitation in new areas, investments and financing for the industry, and mining technology and innovation."

Sustainability of mining

The mining industry has met with severe criticism from society at large because of the recent accidents with tailings dams. Penido says, "The mining industry is united and engaged in efforts to transform productive processes and the rules governing sustainability and safety. The Letter of Commitment, which Ibram drew up in 2019, is just one among a



**WE LEARNT A GREAT DEAL FROM
THE PANDEMIC. WE IMPROVED
OUR COMMUNICATION WITH
COMMUNITIES**

WILSON BRUMER

“THIS WAS A POSITIVE POINT, SO MUCH SO THAT WHEN OPERATIONS WERE RESUMED, WITH EXPANSION IN SEVERAL AREAS, WE WERE ABLE TO KEEP PEOPLE IN EMPLOYMENT AND MAINTAIN OUR INVESTMENTS.”

cluster of actions that are now under way. There are short, medium and long-term initiatives. Each of the companies that has joined this broad movement for renewal has taken actions in several areas of its operations, such as tailings management, operational safety, energy and water resources management, as well as community relations, among others that are equally as important.” In November 2020, he recalls, leading executives and CEOs of mining companies, jointly with Ibram, reported the results of these advances. “In other words, these are commitments that we are fulfilling and making public in order to keep society abreast of what we are doing.”

Other areas to do with sustainability, in which Ibram is taking action jointly with its member companies, include setting up TSM Brazil, based on the Towards Sustainable Mining Methodology created by the Mining Association of Canada (MAC); adoption of Global Industry Standards on Tailings Management; and creating more space for good practice under the heading of Environment, Social Responsibility and Governance (ESG).

Commenting on the mining industry’s response to the Covid 19 pandemic, Wilson Brumer, the chairman of the Ibram Board of Directors, says the mining industry had to overcome many challenges in 2020, but even so ended the year with a very strong performance. “We learnt a great deal from the pandemic. We improved our communication with communities. The people

in charge of operations throughout Brazil are often located in remote spots lacking adequate infrastructure. This means that the mining industry played a leading role in combating the pandemic and giving support to the communities. So much so, in fact, that the amount spent on community support and operations, in terms of equipment, oxygen masks and other items, exceeded R\$ 1 billion, taking all the companies into account. It is always important to point out that mining activities are carried out even in places to which the State has no access due to the lack of infrastructure.”

A factor of great importance, Brumer says, is that in the early stages of the pandemic, mining was listed as an essential activity. “The industry took steps to prepare for the pandemic; it adopted a wide range of rules to ensure safety, such as limiting the number of people in operating areas, while a substantial proportion of employees were working from home.”

Every effort was made to avoid layoffs, with the result that the industry managed to overcome the crisis with no loss of jobs. “This was a positive point, so much so that when operations were resumed, with expansion in several areas, we were able to keep people in employment and maintain our investments.”

“Bearing in mind that for each position in direct employment created in the industry there are eleven others in indirect employment,” Brumer concludes, “this means that mining saved nearly 2 million jobs altogether.” □



WHAT DOES BRAZIL NEED TO DO TO ATTRACT MORE INVESTMENTS?

What are the main impediments to be overcome, for there to be more investment in mineral exploration in Brazil? For Luís Maurício Azevedo, the president of ABPM (the Brazilian Association of Mineral Survey Companies), one of the prime conditions is to provide “potential mining areas freely available for exploration, in other words, areas that are accessible for new licence applications. We also need the government to take the appropriate action that will enable us to turn these areas into mines, and as quickly as possible.”

He notes that capital allocation is much more selective these days. “Most companies use investment analysis tools that compare complexity, time frames, and rates of return, so that they’ll be able to offer their shareholders the best possible return on their capital.”

“In today’s Brazil”, he adds, “the conditions

are highly unfavourable, because labour is taxed and so is the purchase of capital goods. Additionally, our financial institutions are aware of that and, logically, they’re no longer so tolerant of the risk factor in mining as they are in the case of agribusiness. To face up to the adverse conditions, we need to make available the geological environments that are most favourable for the discovery of mineral deposits, and we also need to improve the indicators of attractiveness to companies.”

For Brazil to become more attractive to prospective investors in mining activity, what is needed, Azevedo says, is “Clear rules, an effective analytical model, and effective decision-making in issuing mining and environmental licences. If a mining company has conditions to fulfil and deadlines to meet, then so, too, should the public sector. If we want a dyna-



Luis Azevedo

mic and competitive business environment, then an analyst, the head of a department, or even a senior ministry official should not have unlimited time at his disposal to complete an analysis or to make a decision about issuing a permit or a licence. Our greatest challenge is to make the government and the general public understand that this does not mean the loss of sovereignty or of our independence. On the contrary, it can be done while leaving the existing analysis criteria unchanged, and without posing any threat to society or to the environment. On the contrary, the lack of deadlines, or deadlines that are overlong, signifies rewarding mismanagement on the part of the public authorities. Society as a whole, and not just the mining industry, needs to take an active part in reforming the Brazilian state. We need to demand what is ours by right, a quality public service performing in a reasonable time frame. Without that, we will continue to just mark time, instead of advancing.”

Priorities

Asked what priorities the industry hopes for from the government, the top priority, Azevedo says, would be to release more areas. “This

means going beyond the 70,000 areas on public offer, because the ANM needs to speed up the processing of licence applications. It’s essential to conclude the digitalisation of the ANM’s procedures and cut down on the regulatory burden. The ANM is currently holding nearly 50,000 applications pending analysis, waiting for research permits to be issued.”

Azevedo regrets that there are still those who defend the earlier analysis and inspection procedures carried out by the DNPM, while turning a blind eye to the backlog that has built up. There are 130,000 applications in the queue. In addition, improvements are needed in the regulatory environment. Recently we had inputs and meetings with the industry on the subject of mining law, addressing questions such as guarantees, the regulations to be adopted under the Brazilian Resources and Reserves System, the confidentiality of mining applications, and the recovery of tailings. These recommendations are ready for publication. They were drawn up with the active participation of the government and civil society. All these are much-needed regulatory priorities, including all the regulations and norms left pending that are required under Decree 9406/18. Let us not forget that they arose at the initiative of the executive branch itself.”

The ABPM also stresses the need for the National Mining Agency (ANM) to be restructured. “The decision was made by the collegiate board, and the work is now being done,” Azevedo says. “We hope that, as a result, the ANM will gain the means it needs for the optimal management of mining, incorporating best regulatory practice, enabling it to make the advances eagerly awaited by the Brazilian mining industry.” □

FEDERAL GOVERNMENTAL ORGANIZATIONS

Ministério das Minas e Energia – MME

(Ministry of Mines and Energy)

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Secretaria de Geologia, Mineração e Transformação Mineral – SGM

(Geology, Mining and Mineral Transformation Secretary)

Secretary: Alexandre Vidigal

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E-mail: sgm.gab@mme.gov.br

www.mme.gov.br/sgm

Cia. Pesquisa e Recursos Minerais – CPRM

(Brazilian Geological Survey)

President: Esteves Pedro Colnago

Setor Bancário Norte – SBN

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Phone: +5561 2108-8400

E-mail: cprmsede@df.cprm.gov.br

www.cprm.gov.br

Agência Nacional de Mineração – ANM

(National Mining Agency)

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Edifício CNC III

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Phone: +5561 3312-6611

E-mail: ascom@anm.gov.br

www.anm.gov.br

Centro de Tecnologia Mineral - CETEM

(Mineral Technology Center)

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Av. Pedro Calmon, 900 - Cidade Universitária

21941-908 – Rio de Janeiro – RJ

Phone: +5521 3865-7222

E-mail: cetem.info@cetem.gov.br

www.cetem.gov.br

PRIVATE ORGANIZATIONS

Agência para o Desenvolvimento Tecnológico da Indústria Mineral Brasileira – Adimb

(Brazilian Mineral Industry Technologic Development Agency)

Executive Director: Roberto Perez Xavier

SCN Quadra 02 - Bloco D - Torre A - salas 501/503/505

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70712-903 – Brasília – DF

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E-mail: contato@adimb.org.br

www.adimb.org.br

Associação Brasileira do Alumínio – Abal

(Brazilian Aluminium Association)

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Associação Brasileira de Cimento Portland – ABCP

(Brazilian Cement Association)

President: Paulo Camillo Penna

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Associação Brasileira de Cerâmica - ABCeram
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Associação Brasileira da Infraestrutura e Indústrias de Base – Abdib

(Infra-Structure and Base Industry Brazilian Association)

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Associação Brasileira das Empresas de Pesquisa Mineral – ABPM

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(Brazilian Association of Equipment and Machinery Industry)

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Associação Nacional das Entidades de Produtores de Agregados para Construção Civil – Anepac
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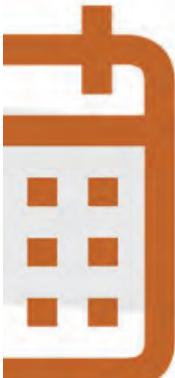
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