



GLOBAL BUSINESS REPORTS

**BRAZIL MINING
2024**



Pre-Release Edition



In the International Spotlight

An introduction to Brazil's mining industry

Brazil will find itself in the international spotlight later this year as it takes on the rotating presidency of the G20 in 2024 and prepares to host world leaders from the world's biggest economies in Rio de Janeiro this November. The summit's motto, 'Building a Just World and a Sustainable Planet', underlines the Lula government's attempts to make green diplomacy the fulcrum of Brazil's foreign policy. There are two central pillars to this policy: custodianship of the Amazon rainforest and the provision of critical minerals for the electrification of supply chains. The mining industry is transforming in Brazil, growing, diversifying and coming under greater scrutiny from over-stretched regulators.

Brazil is clearly a mining power, as the world's largest producer of niobium and second largest of iron ore, and home to Vale, which generates over US\$40 billion in revenue a year. According to figures from IBRAM, Brazilian mineral exports reached US\$42.98 billion in 2023. Despite these figures, over 50% of the country remains geologically unmapped, and several discoveries in recent years across different commodity classes, from gold to rare earths, point to the country's untapped potential.

Brazil's mining sector is still dominated by iron ore production, however, there are developments and projects across a suite of different minerals laying the foundations for the country to become a leading exporter of minerals crucial for the energy transition. Marcos André Gonçalves, president of ADIMB, said: "There are several new developments in the mineral exploration scene for rare earth, lithium, and base metals... The energy transition has influenced the mining sector for good, with new exploration investments from Australian, Canadian and American companies."

"Brazil's capital markets are strong but lack the mining expertise of global mining exchanges. The Brazilian market realizes the need to support the clean energy transition locally."

Guillaume Légaré, Head, South America, Toronto Stock Exchange and TSX Venture Exchange



The mining industry's principal challenge globally is access to capital, and in Brazil it is no different. The sector is caught in a curious paradox between the increasing demand for critical metals and less financing available to develop long-term, capital-intensive projects. Discussing Brazil's mining finance eco-system, Guillaume Légaré, head of South America for the Toronto Stock Exchange and TSX Venture Exchange, said: "Brazil ranks fifth in Latin America, with 34 companies with 95 mining projects in the country. Given its size, this makes it a relatively under explored jurisdiction represented on our exchanges, underlining its potential. Although there is significant potential for growth in Brazil's mining sector, we need to promote it further to facilitate capital access for local entrepreneurs."

Mining leaders stressed the need for more financing opportunities due to the dearth of available capital, distorted by market trends, and a reluctance from public investors and traditional banks to invest in sensitive mining and long-term capital projects. Instead, private equity houses are picking up some of the slack. There are, however, public initiatives to encourage a mining finance eco-system in the country. In addition to talks about promoting a Rio de Janeiro stock exchange, which will be more open to junior mining companies, Adriano Trindade, partner at Mattos Filho, a leading Brazilian law firm, said: "Currently, BNDES is structuring a fund aimed at investing in critical minerals, particularly in exploration and development. BNDES will contribute 25% of the fund and is now seeking the remaining 75% from other investors."

For Appian Capital Advisory LLP, a leading private equity player in Brazil's mining industry with US\$3.6 billion of assets under management, whose portfolio includes Atlantic Nickel, Mineração Vale Verde, Graphcoa and Omnigen Energy, the dearth of available capital for mining projects is being tackled head-on. Discussing these challenges, Silvio Lima, head of corporate affairs, ESG and community engagement said: "The inherent volatility of commodity prices makes securing financing for long-term projects difficult. Additionally, mining projects often have lengthy lifespans. This extended project cycle can deter potential investors seeking quicker returns."

The investment house is bullish about the future of mining and Brazil's role as a provider of critical minerals necessary for the global energy transition. Lima said: "The increasing demand for minerals essential for renewable energy technologies and electric vehicle batteries creates a unique opportunity for investors to support the green transition." ■

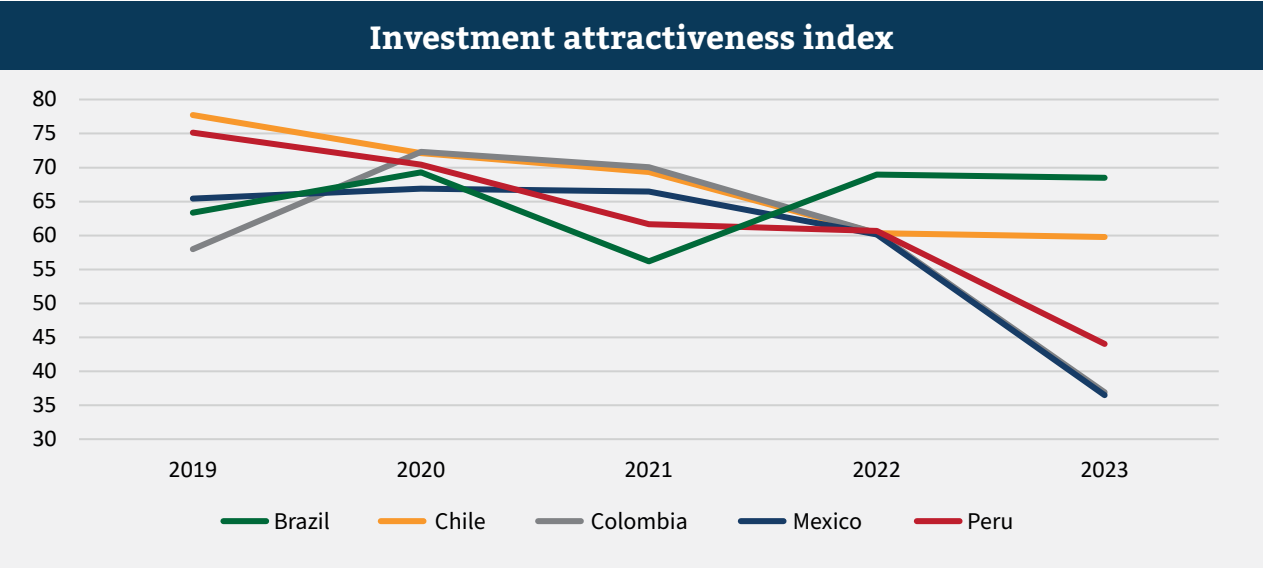
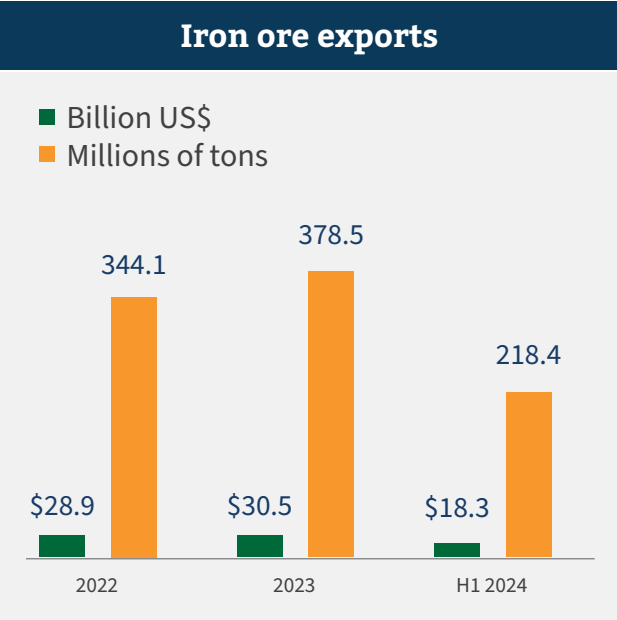


Sources: World Bank Group, Brazil's Ministry of Mines and Energy. Data for 2023.

- GDP (current US\$)
2.17 trillion
- GDP growth
2.9%
- Population
216.4 million
- Renewable energy generation (% of total)
93.1%
- Inflation, consumer prices (annual change)
4.6%



Source: IBRAM, Ministry of Development, Industry and Foreign Trade



Source: Fraser Institute Annual Survey of Mining Companies, 2023



Image courtesy of AngloGold Ashanti

Mining Production

Mineral output in Brazil continues its upward trajectory

Iron production is the engine of Brazil's mining sector, dominating the industry by volume. The country's leading player, Vale, has achieved several milestones this year. Following 2023's production achievements, when production increased by 29% yearly, 2024 has been no different. Its Q2 2024 figures point to an increase of 2.4%, or 80.6 million t/y, putting the company on track to reach its projected guidance figures of producing between 310 and 320 million t/y in 2024. Vale also reported reaching 100% renewable energy consumption this year.

Vale is pursuing an international strategy of developing Mega Hubs worldwide, including in Saudi Arabia, establishing industrial

complexes to manufacture low-carbon steel products and supply briquettes. In the lead-up to the Rio de Janeiro G20 summit this year, delegations from Saudi Arabia's Ministry of Mining have visited Vale facilities in the country. Vale's partnership with Saudi Arabia's Manara Minerals, a joint venture between Ma'aden, Saudia Arabia's state-owned mining company, and Saudi Arabia's Public Investment Fund, was completed this year, with Manara Minerals acquiring 10% of Vale Base Metals Limited (VBM).

Samarco is continuing its journey of reconsolidation, and in 2023, approved a debt renegotiation deal and a R\$1.6 billion investment into the company's production process, increasing production capacity to 60% and constructing new filtration systems. Samarco is also investing heavily in its operational workforce and has plans to hire 600 direct employees. The company's total workforce, over 15,000 strong, now exceeds its pre-2015 levels. Samarco also reports that it has achieved 75% completion on the de-characterization project of the Fundão dam, one of Latin America's largest. Discussing Samarco's gradual recovery of production and operations, Rodrigo Vilela, Samarco's CEO, said: "In 2025, we aim to produce approximately 15 million tons of pellets, which positions us as one of the second or third-largest exporters globally, a significant player as we were in the past. Our focus remains on completing this project, our primary expectation for 2025."

Discussing some of the technical and operational challenges that Samarco is confronting as it continues to revamp its operations, Vilela said that finding use for the enormous volumes of waste material has been the company's principal challenge. On this topic, Vilela added: "The primary challenge is consolidating our operations while introducing new technologies, particularly finding uses for our waste materials. We are already constructing roads and pavements using these by-products, representing a significant challenge for the entire industry, not just Samarco."

Beyond Vale, there are new entrants to the iron industry, which include Lhg Mining, part of the J&F Group, the largest private conglomerate in Brazil. J&F Group acquired assets from Vale in 2022, including the Santa Cruz and Urucum mines in Mato Grosso do Sul. Its operations include a fully integrated supply chain, and river ports to transport material via barge through the Paraguay waterway to ports in Uruguay, particularly in Nueva Palmira. Discussing Lhg Mining's rapid adaptation and entrance to the market, Claudio Alves, director of new business, said: "Our 12-month investments since the acquisition include growing our team by 200%, recruiting senior

leadership, and revamping processing systems to handle 12 million t/y, now aiming for 16 million t/y."

The company has been able to lean on the financial muscle of the J&F Group, investing heavily in updated processing systems, new fleets of equipment and qualified teams. Targeting European markets for export, Lhg Mining is producing high-grade lump ores and is depending on Europe's transition from high to low-emission industries, introducing carbon pricing and ESG sensitivity. Lhg Mining's growth has been explosive, but the company has encountered some bottlenecks. This year's principal challenge has been a drought in the region, impacting the river barge transportation system. As Alves explained: "Our main challenge involves managing complex logistics in a remote region bordering Brazil and Bolivia. Our ore travels 2,500 km along a river route to reach a shallow water port, necessitating innovative solutions to streamline operations and lower costs."

3A Mining, an iron producer that operates in the same region, has an installed capacity of 1.5 million t/y and depends on the same transportation system as Lhg Mining. The drought has postponed 3A Mining's efforts to double production figures. Discussing the industry's challenges in the region, Fabio Assumpção, mining operations, logistics & sales director, said: "Transportation constraints in Mato Grosso do Sul have been a challenge. The region has experienced a severe drought, hindering the transport of materials from the Corumbá river port to the maritime port in Uruguay. As a result, we have limited our production capacities this year."

In Minas Gerais, the country's mining heartland, Belo Horizonte-based LGA Mineração e Siderurgia is an iron ore producer with a

"Brazil is well-positioned to supply products with significantly lower emissions than our competitors. Our production process utilizes clean energy, and our operations are designed to minimize emissions."

Rodrigo Vilela,
CEO,
Samarco



capacity of 2 million t/y at the Congonhas plant. The company, which supplies Vale, CSN, and Gerdau, is currently in the engineering phase of increasing its capacity to 4.5 million t/y. Discussing how LGA has diversified its business by establishing commercial partnerships, Paulo Toledo, LGA Mineração e Siderurgia's CEO, said: "Before the Mariana accident in Brazil, we invested in equipment to treat our waste, specifically in 2015 when we established a collaboration with Jing-Jin, the largest manufacturer of filter presses globally. Today, we represent them in Brazil, supplying equipment for mining, waste treatment, water treatment, chemistry, and fertilizers."

Brazil is also one of the world's leading tin producers. Mineração Taboca, which in 2008 became part of the Peruvian company Minsur,

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"The global tin market is highly consolidated and is expected to grow steadily over the next years, mainly driven by an increase in electronical industries, particularly for soldering applications."

Eduardo Orban, CEO,
Mineração Taboca



operates the Pitinga mine, a rich tin and tantalum mine located in the Amazon Region, and a tin smelter in Pirapora do Bom Jesus, near São Paulo. Mineração Taboca is the leading mining company in Amazonas, and Eduardo Orban, Mineração Taboca's CEO, discussed some of the logistical and operating challenges faced by the company: "We are adjacent to a biological reserve and two Indigenous communities, with one of them we have a long-term agreement to give access to our properties. Maintaining good relationships with these communities is crucial."

Mineração Taboca has invested heavily in its ESG credentials. Orban said: "We have responsible mineral initiative certifications for our tin and tantalum smelters, controlling the entire supply chain from our mines to smelters. Taboca is ISO 9001, ISO 14001, and ISO 45001 certified. We follow ICMM sustainability requirements." In Pará state, MRN – Mineração Rio do Norte, Brazil's biggest bauxite producer and exporter, is continuing work on the life extension of the East Zone, delivering the Front-End Loading phase on the

"Luanga presents a compelling case for open pit mining due to its shallow mineral deposits, reaching a maximum depth of approximately 300 meters."

Luis Azevedo,
CEO,
Bravo Mining



mining project and transmission line. The company is also developing its West Zone bauxite project, which will supplement MRN's production and is expected to come online in 2028. Like Taboca, MRN operates in a sensitive environmental area and has focused its efforts on engaging with local Quilombo communities. A crucial element of this regards tailings dams, and MRN has imported specialized equipment from Australia to increase the solid content of tailings. Guido Germani, CEO of MRN, said: "We have focused on accelerating the tailings drying, leveraging the sun's natural drying power. We are also exploring remote operations for mining, mainly for the big dozers."

Largo Inc, which runs a vanadium operation located in Maracás in Bahia, is navigating historically low vanadium prices. To manage volatility in the market, Daniel Tellechea, CEO of Largo, commented: "Largo currently operates with two main strategies: a short-term strategy focusing on navigating low commodity prices through efficiency and restructuring and a long-term strategy aimed at increasing vanadium and ilmenite production."

Even at high gold prices, financing eludes gold juniors

Gold prices are reaching historic highs, and producers are reaping the benefits. Aura Minerals has since 2020 had Brazilian depository receipts, making it the first gold company listed in Brazil, in addition to its TSX listing. High prices have allowed Aura Minerals to deliver US\$170 million in value to shareholders through new dividends and share buybacks in the last three years. The company is targeting production of 450,000 oz/y by 2025. According to Rodrigo Barbosa, CEO of Aura Minerals: "We are focused on unlocking value in three areas: developing

three Greenfield projects (Almas, Borborema and Matupá) on time and on budget, significant investment in exploration, increasing our mineral resources and reserves, and growing through M&A."

Aura Minerals' exploration efforts include the Serra da Estrela project in Carajás, Pará, a copper IOCG deposit that the company wants to develop into a copper mine. According to Barbosa, this development will contribute to Aura Minerals' diversified metals strategy, maintaining a balanced portfolio with 30-40% of revenue from copper and the rest from gold.

In Brazil's north, Canadian companies such as the TSX-V listed Bravo Mining are developing projects in Carajás. The exploration and development company is advancing its Luanga PGM+nickel deposit. Following a drilling and aerial mapping campaign and identification of anomalies, 17 high-priority targets for exploration were confirmed. Luis Azevedo, CEO of Bravo Mining, said: "T5 delivered the best yet copper-gold intercept of 2024 globally and top five over the last five years. The subsequent drilling on T5, hole 004, also ranked as the third-best intercept globally."

Bravo Mining recently submitted environmental reports for the Luanga project. Discussing the potential scale of this project, Azevedo mentioned: "With clear evidence of mineralization at depths up to 450 meters, Luanga's resource potential could feasibly double or triple, underpinning our long-term mine life projection of +20 years", adding that "Carajás represents a frontier mining region where significant deposits are still viable."

Kinross, another major gold producer in the country, is riding the wave of high prices. The company produced 588,000 ounces of gold in 2023, equivalent to 22% of Brazil's total gold production. Gilberto Azevedo, President of Kinross Brasil commented that "For 2024, we hope to maintain the same level of production", adding that in Brazil, "In 2024, we project an approximate investment of USD\$ 146 million."

Major gold companies are establishing production in Brazil. Hochschild Mining, the Lima based LSE listed gold miner, has entered commercial production at their Mara Rosa mine, based in Goiás state. The company, which entered Brazil for the first time in 2022, plans to produce over 100,000 ounces of gold in the first four years of production. Hochschild also recently signed an agreement with Cerrado Gold, giving the miner the option to purchase 100% interest in the Monte do Carmo gold project in Tocantins, covering 21 mineral concessions.

Pará state is becoming a hub for gold mining. G Mining Ventures, the Canadian TSX listed gold producer, is also present in Tocantins. It entered Brazil in 2021, through the acquisition of Eldorado Gold. The company's Tocantinzinho gold mine poured gold for the first time in July 2024, and the mine's feasibility study indicates a projected production of 175,000 ounces of gold per year for the next 10 years, turning G Mining Ventures into a significant gold producer in the country.

Gold projects are advancing across the north, and the Pará state government's environmental agency has been busy working alongside mining companies trying to advance their projects in the region, including G Mining, Hochschild Mining, Ero Copper, and Aura Minerals. TriStar Gold, a TSX-V listed junior focused on developing its flagship gold Castelo de Sonhos project in Pará state, had its Preliminary License (LP) and Environmental Impact Assessment (EIA) approved this year. Nick Appleyard, TriStar Gold's president and CEO, discussed the attractiveness of Pará as a mining jurisdiction because



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Mineração Taboca was founded in 1969 and operates in the mining and metallurgy of tin and industrial minerals. It is one of the few companies active in the world tin market to own its own mine, and the Pitinga Mine, located in the Amazon Region, is one of the richest in the world, with an estimated longevity of 100 years.



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of its geology and the state government's experience working with mining companies: "This makes the regulatory process smoother compared to regions where mining is less familiar. The history of mining in Pará means that the communities understand and support the economic benefits it brings."

Community engagement has been a critical focus for the company, ensuring the Castelo de Sonhos project has both regulatory and social support moving forward. Discussing the importance of state and community engagement, Appleyard said: "After submitting the EIA, the Pará State Environmental Council (COEMA) reviewed it, conducted a site visit, and held a public hearing or town hall meeting. This meeting allows everyone to have their say. Our recent meeting had about 600 attendees and was very successful, showing strong community and state support."

Another TSX-V listed gold developer in the state of Pará is Cabral Gold, advancing its pre-feasibility study at the company's Cuiú Cuiú project. Cabral Gold announced drilling results cutting 11 m at 33 g/t of gold at its Machichie NE target and has hired a new VP of exploration, Brian Arkel. The state, which is famous for its iron ore mining, is becoming a gold destination. Alan Carter, CEO of Cabral Gold, mentioned: "Large scale gold mining is relatively new to this part of Brazil, which is surprising as it was the site of the world's largest-ever gold rush in the 1980s, with estimates of over a million people recovering 20-30 million oz of gold in its rivers, all through informal mining."

Gold mining in the state occurs in remote areas, and infrastructure and access present challenges for players across the board. Despite

"The quality of the Brazilian workforce is outstanding and this is allowing us to build our projects efficiently. Our management team has been highly impressed with how quickly and effectively we were able to set up operations and deliver results in Brazil."

Rodrigo Nunes,
COO,
Hochschild Mining



this, Carter from Cabral Gold is optimistic about the region's development: "The paving of BR-163, a major north-south federal highway, and the installation of a 190-km power line to bring grid power within 20 km of our site, are notable recent improvements in infrastructure."

Just across the state border in Matto Grosso, Altamira Gold, a TSX-V gold developer, is working on its flagship Cajueiro project, which straddles the border between Pará and Matto Grosso. In 2019, the company filed a 43-101 compliant resource of 700,000 oz gold for it. More recently, drilling efforts from Maria Bonita, a gold-in-soil anomaly, made a historic discovery: one of Brazil's first gold porphyry systems. Discussing this development, Michael Bennett, president and CEO of Altamira Gold, said: "We are now diligently working to determine the extent of the gold mineralization at Maria Bonita and exploring other areas within our 30,000-hectare claim block for similar deposits."

Junior companies need help attracting long term financial commitments and investments in their projects, regardless of their promise. Access to capital remains an issue, and dilution is a significant concern for junior companies. Altamira Gold has developed a cashflow strategy through small-scale production to mitigate these challenges, as Bennett explained: "With good metallurgy, excellent access, cheap hydro-electric power and the potential for multiple significant discoveries within our 30,000-hectare claim block, we aim to provide substantial value to our shareholders through small-scale production and subsequent exploration funding."

Mining for Brazil's food security

Alongside mining, another pillar of Brazilian exports is the agricultural industry. Brazilian agricultural exports continue to surge yearly; agricultural activity grew over 15% between 2022 and 2023, according to the Brazilian Institute for Geography and Statistics. Producers in Russia, Belarus and Canada dominate the global fertilizer market. As this sector continues to grow, the country's reliance on foreign imports of potassium and phosphate, crucial for fertilizer products, becomes an increasing risk, and mining companies are delivering projects to confront this shortfall and secure Brazil's strategic autonomy and food security.

One such example is Potássio do Brasil, which is developing its flagship Autazes project, which seeks to produce 2.2 million t/y of potassium, equivalent to 17% of Brazil's consumption, once completed. Over the past year, Potássio do Brasil has accomplished

notable milestones, including approval of the Autazes project's implementation license. Discussing the importance of securing domestic production for the country, Adriano Espescht, CEO of Potássio do Brasil, said: "The concentration of potassium production among a few countries poses a potential risk to global supply chains and, in turn, global food security. Our project aims to significantly contribute to Brazil's agricultural sector by reducing dependency on imported potassium and ensuring a stable supply of fertilizers." Espescht continued: "Over the next 12 months, our primary focus will be on advancing key construction milestones, including the development of two 930-meter-deep shafts and essential infrastructure such as the mining plant, access roads, and port facilities."

Morro Verde is an established producer in the fertilizer industry, producing limestone phosphate and magnesium, and is based in Pratápolis. Caíque Souza, Morro Verde's CEO, said: "Our goal for 2024 is to produce 600,000 t of phosphate and limestone, with a target of reaching 1.5 million t/y within a few years."

Souza also commented on the difficulties raising money for capital projects in the mining industry and highlighted the role that private equity is playing in Brazil's mining scene, as Morro Verde recently received substantial investments from Ore Investments, a Brazilian mining-focused investment house. Discussing these challenges, Souza added: "We need a low capital-cost environment to attract investors. Once a resource is discovered, we still require capital to develop it, which is challenging in a high-interest environment."

"Brazil is establishing itself as an important region for mining activity globally, not only in traditional minerals, but also in those considered strategic due to their economic, technological and industrial importance, such as niobium, lithium and rare earths."

Gilberto Azevedo,
President and General
Manager, Kinross Brasil



The Mosaic Company, Brazil's largest fertilizer company that mines phosphate and potash in Brazil and North America, has recently launched a new bioscience division in Brazil, focused on bio nutrition, and is investing heavily in the country's agricultural sector. Nancy Case, vice president of operations and technical services at Mosaic, commented: "The company has made much progress on our blending unit project in Tocantins, a R\$ 400 million investment."

The Mosaic Company's investments via their blending unit in Tocantins and the biosciences division launch point to the company's strong commitment to the country, as well as the belief in its agricultural sector and its future growth trajectory. ■

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Transition Minerals

Brazil positions itself to become a critical minerals provider

Brazil's mining sector has historically been dominated by iron, but its future lies in precious critical minerals, indispensable battery metals and rare earths forming the backbone of future economies and electrified supply chains. Rare earths (REE), lithium, and nickel production and refinement have been long dominated by Asian producers, chiefly China and Indonesia. Moving forward, geopolitical fissures between the West and China are creating opportunities for countries like Brazil to provide alternative, diversified supply chains for these critical materials.

The convergence of geopolitical clashes and the drive for decarbonization also presents opportunities for developing new and previously non-mining regions in the country, most notably the Vale do Jequitinhonha, now known worldwide as Brazil's Lithium Valley. The lithium industry is creating employment and a surge in economic activity, but environmental risks are present, particularly for water management.

Paulo Misk, COO of Lithium Ionic, a TSX-V listed lithium exploration and development company, is one of Brazil's principal lithium players and is developing its flagship Bandeira project, situated between CBL and Sigma Lithium's properties. A feasibility study conducted for the Bandeira projected an NPV of US\$1.3 billion post-tax, based on a 14-year project life at an annual production of 178,000 t/y. The company is at the forefront of lithium developers in Brazil's Lithium Valley. Paulo Misk, COO of Lithium Ionic, said: "Our region boasts high-grade spodumene and minimal amounts of other lithium minerals, ensuring excellent recovery rates of 68.9%. The large crystals mean we do not need extensive grinding, allowing for a simple, low-cost process using ore sorting and DMS."

The solid economic fundamentals of Brazil underpin lithium projects in the country as a mining jurisdiction. Misk added: "Besides great geology, Brazil offers a low capital intensity (US\$785 per ton of LCE) compared to global averages of over US\$1,000 for project development."

Sigma Lithium, which operates the world's fourth-largest lithium industrial complex in Brazil's Lithium Valley, is another industry reference that has transformed the region, driving social and economic growth and development. The company became the first Brazilian exporter of 'green lithium' at the end of 2023, exporting its 'Quintuple Zero Green Lithium', which the company claims uses zero carbon, zero coal power, zero tailings dams, zero utilization of potable water and zero use of hazardous chemicals for production. Ana Cabral, co-chairperson and CEO of Sigma Lithium, said: "We

established a state-of-the-art lithium industrial plant in one of Brazil's poorest regions, transforming the area's economic landscape, which now grows at a rate of 20% per year."

The success of Sigma Lithium's operations stands in contrast to the development of the lithium industry globally and the scale of the task to provide lithium supplies necessary for electrification of supply chains. Projections of future lithium demand far outstrip current and planned production figures. Cabral added: "Since 2018, despite billions of dollars having been invested in lithium globally, Sigma Lithium is the only company that has achieved commercial production at this scale and low cost, ensuring our adaptation and competitiveness amidst volatile market fluctuations."

Sigma Lithium's success and industrialization efforts have faced a common challenge: the availability of labor. Cabral explained how the company overcame this issue: "We initiated a 'homecoming program' to recruit talent from the region, including people who had emigrated, successfully employing 85% of our 1,200 employees from the local area."

Marc Fogassa is CEO and chairman of Atlas Lithium, a NASDAQ-listed lithium developer, whose Minas Gerais lithium project is set to enter production in Q4 of 2024. In addition, the company is pursuing REE and graphite projects in the country. Cognizant of the difficulties facing the lithium market due to high volatility and low prices, Atlas Lithium's strategy has been to excel in cost discipline and secure offtake agreements early. Fogassa said: "Atlas Lithium has established significant partnerships with major companies. Chengxin Lithium Group, associated with BYD and Yahua Industrial Group, a Tesla supplier, invested \$10 million in total in December

"The future of lithium is very bright, as all forecasts point to demand outpacing supply by 2028 as electrification continues to scale, meaning that the price of lithium will continue to rise."

**Paulo Misk, COO,
Lithium Ionic**



2023 and committed another \$40 million in total upon certain customary milestones. In March 2024, Mitsui, a major Japanese conglomerate, invested \$30 million."

For Fogassa, green lithium is what will separate Brazilian lithium producers from the pack. Discussing the Dense Media Separation (DMS) technology that Atlas Lithium will implement, and the general sustainability credentials of their flagship Minas Gerais lithium project, Fogassa commented: "The plant is designed to use minimal water, setting a new standard for water efficiency in lithium processing. We are also in the process of working with the state electric utility to obtain a dedicated power line which will transmit renewable hydroelectric power as we aim to run a carbon-neutral operation in the future."

Given the region's aridity, water management is a crucial issue. Competition for water with local communities is a major risk that mining companies face, and one that the lithium miners of the Vale do Jequitinhonha are tackling head-on, from Sigma Lithium's Quintuple Zero Green Lithium to Atlas Lithium's DMS plant's minimal water use.

Vinicius Alvarenga, CEO of Companhia Brasileira de Lítio (CBL), which produces nearly 45,000 t/y of spodumene concentrate and around 2,000 t/y of lithium chemicals, discussed some of the industry's principal challenges. As an established producer and the lithium pioneer of the Jequitinhonha Valley, lithium prices have profound implications for the company, which is exploring the potential of expanding its operations to double production. This year, it became the first lithium company worldwide to receive the BV 360 certification from Bureau Veritas, a comprehensive ESG award incorporating various environmental, social and governance ISO standards. Alvarenga said: "There is a paradox in the lithium market. Despite optimistic future demand projections, current market conditions are subdued."

Despite some of the difficulties the industry faces because of historic low prices, Alvarenga is optimistic about the future of lithium in Brazil and the prospects for higher demand as electrification is further embraced in major consumer markets such as the United States: "As the lithium market expands, the Jequitinhonha Valley will continue to attract junior explorers eager to capitalize on its abundant resources."

Alvarenga was not so optimistic about the current stance of the Brazilian government regarding E.V. adoption: "While commendable for its environmental benefits, Brazil's unique focus on ethanol as a sustainable fuel has inadvertently isolated the country from global shifts towards electric mobility, lacking comparable incentives or infrastructure support for electric vehicles."

Nickel: The green alternative

In addition to lithium and REE, Brazil's nickel scene is also growing, with Brazil's geography, geopolitics, and green energy credentials providing it the ability to carve out a niche in global nickel markets, presently dominated by Indonesian producers.

Centaurus Metals, an ASX-listed Australian developer, has recently delivered a positive feasibility study for its flagship Jaguar nickel project, located in Pará state. The results include an estimated mine life of 18 years at an average annual production of 18,700 t and forecasted pre-production capital expenditure of US\$371 million, and the company is actively value engineering

to improve these results. Bruno Scarpelli, Centaurus Metals' country manager, said: "Brazil offers several important cost advantages as a mining jurisdiction – it has ultra-low-cost energy, a low corporate tax rate and an attractive Government royalty regime."

Indonesian and Chinese dominance of critical mineral production, including nickel, is well established, but Brazil-focused miners want to differentiate their products, stressing Brazil's green energy matrix and stringent environmental regulatory framework, in contrast to their Asian competitors. Scarpelli said: "While Indonesia's laterite nickel deposits are substantial, they are energy-intensive and primarily coal-powered, resulting in high carbon footprints". By contrast, Scarpelli said: "Brazilian power is almost entirely generated from renewables, so in addition to being low cost, Jaguar's power supply will also have extremely low carbon emissions."

Global nickel prices are volatile, and the sheer volume of Indonesian production is driving prices lower. Another prominent developer of nickel in the country is Brazilian



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Nickel, focused on its flagship Piauí nickel project in northeast Brazil, which is at an advanced stage. According to Mark Travers, CEO of Brazilian Nickel, the Piauí nickel project is intended to be the first to apply the heap leaching process on a commercial scale for nickel.

The sentiment across the industry is that Brazilian projects can differentiate themselves through their higher ESG standards, leveraging these with the tide of EV battery makers, auto manufacturers and Western government's intentions to diversify their supply chains away from Asia. Discussing the Piauí project's ESG credentials, Travers mentioned: "Our clean energy profile features a low CO2 intensity in our nickel production, especially in our mixed hydroxide precipitate (MHP), one of the lowest CO2-emitting products in the market."

Underlining the vital role of private equity investments in the sector and the importance that Western governments are assigning critical mineral projects, Brazilian Nickel's financiers include TechMet, a company focused on financing projects that contribute to the energy transition and the U.S. Development Finance Corporation. Mark Travers from Brazilian Nickel commented: "While traditional nickel sources have been heavily concentrated in Indonesia and China, we see an opportunity to fill that gap by providing a sustainable alternative from Brazil."

REE: Rare Earths are not so rare in Brazil

Goiás state is becoming the centre of Brazil's burgeoning REE scene. Serra Verde is one of the few companies able to tap into an ionic-lay REE deposit, which is rare outside of Asia. The company,

"Since 2018, despite billions of dollars invested in lithium globally, Sigma Lithium is the only company that has achieved commercial production at this scale and low cost, ensuring our adaptation and competitiveness amidst volatile market fluctuations."

Ana Cabral,
Co-Chairperson and
CEO, Sigma Lithium



whose financial backers Vision Blue and Energy and Minerals Group invested US\$150 million in December 2022, has entered commercial production, making it the first scale operation to produce four critical magnetic REEs outside of Asia, showcasing Brazil's REE potential. Serra Verde is optimistic that the demand for REEs sourced outside of Asia will boom, mainly due to the prevalence of high-value heavy and light REEs, primarily neodymium (Nd), praseodymium (Pr), terbium (Tb) and dysprosium (Dy), which are crucial for battery production and have military and aerospace applications too. According to Thras Moraitis, CEO of Serra Verde: "The transition to clean energy relies heavily on rare earths. This necessity extends beyond commercial

applications to geopolitical and military uses, making rare earths critical in global energy strategies."

Moraitis was positive about Serra Verde's interactions with state and federal authorities, acknowledging that Brazilian authorities are aware of Brazil's opportunity to compete with Asian producers and become a partner of choice for Western manufacturers and high-value industries, including aerospace. Moraitis said: "Europe, Canada and the US have provided substantial financial support to their critical minerals industries. Brazil should consider similar funding initiatives to help local producers compete globally."

Aclara Resources, a heavy rare earth-focused developer with projects in Chile and Brazil and that has its origins in Hochschild Mining, is developing a heavy rare earth project called the Carina Module project in Goiás. The company IPO in 2021 raised US\$100 million, which it funneled into exploration in Brazil. A recent PEA for the Carina Module conducted by GE21 Consultoria Mineral outlined a project life of 17 years, processing 150 million tons over this period and a net present value (NPV) of US\$1.2 billion. Francois Motte, CFO of Aclara Resources, said: "Our process is highly sustainable; unlike traditional mining, we avoid explosives, crushing, and milling, which reduces energy consumption and environmental impact. Our patented Circular Mineral Harvesting technology efficiently recovers rare earths from ionic clay with a minimal ecological footprint. The process uses ammonium sulfate, a common fertilizer, which is non-harmful when appropriately handled. We employ a water recycling system akin to desalination plants, achieving a 95% water recirculation rate. The mining operation generates no tailings and ensures the land is returned to its original state with revegetation."

In addition to its patented technology, Aclara Resources is pursuing a vertical integration strategy. Motte discussed how this strategy was crucial in the context of a REE market dominated by Chinese players and because of the difficult financing environment for mining companies: "This integration allows us to control the entire production process, from raw material extraction to final product refinement, enhancing our market position."

Brazilian Rare Earths (BRE), the ASX-listed developer of rare earths founded in 2021, recently raised US\$80 million to develop high-grade ionic deposits in the Rocha da Rocha critical minerals province in Bahia state. The company has confirmed high-grade intercepts into the thirties through its drilling campaign, placing them at the forefront of global REE projects. Bernardo da Veiga, managing director and CEO of BRE, said: "During the drilling at Monte Alto, we

hit a significant intercept: 14 meters at 11% in saprolite. Ionic clays typically have grades between 0.1% and 0.3%, so we realized that this mineralization could not possibly be ionic clays. It turned out to be coarse grained liberated monazite in the saprolite."

The high grades have convinced BRE that the company can commercialize its deposits with minimal impact on the region. da Veiga explained: "We only need to mine a small volume to produce the same amount of rare earths as lower-grade deposits, leading to lower environmental impact, reduced water and energy usage, and less dust and noise."

BRE's project could transform Brazil's rare earths sector, but more needs to be done from the federal level. BRE's da Veiga commented: "Brazil needs to incentivize companies to add value domestically through political, tax, and other policies that support the establishment of downstream operations. Brazil already has a large industrial base and a skilled workforce. These factors position Brazil well to become a critical minerals powerhouse."

REE deposits are also attracting the attention of junior companies with interests in copper and other such commodities, including Alvo Minerals, an ASX-listed Australian junior focused on developing its Palma copper-zinc VMS project, but also venturing into REE through its Bluebush ionic clay rare earth project, adjacent to Serra Verde. Rob Smakman, CEO of Alvo Minerals, said: "Bluebush was too good to be overlooked. It is adjacent to our base in Tocantins and to Serra Verde, the only ionic clay project outside China that is in production."

Another example is Appia Rare Earths & Uranium Corp, with its history of uranium and rare earth projects in northern Canada, that made the foray into Brazil in early 2023, entering an ionic absorption clay project near Iporá, Goiás, in the same region as other leading REE players. Stephen Burega, president of Appia Rare Earths & Uranium Corp, said: "Our experience in Brazil has been exceptional, showcasing supportive mechanisms and streamlined regulatory frameworks that make it a top global mining destination."

Appia Rare Earths & Uranium Corp's experience in Brazil points to an evolving regulatory approach to critical minerals exploration, with the federal government grasping the importance and potential of the country to significantly benefit from a diversification of supply chains away from Asia. According to Burega: "Brazil's rich mineral resources, including rare earths, position it to become a significant global player, provided technological advancements and local resources are effectively leveraged." ■



Image courtesy of Serra Verde

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Engineering and Consulting

Environmental compliance and mining development drives demand

The past year has seen a flurry of activity in the mining sector, driving demand for consultants and engineers. According to figures from IBRAM, Brazil is poised to receive over US\$65 billion in inward mining investments in the coming five years. Ongoing and prospective projects in different stages of development are driving record demand for consulting and engineering services, coupled with increasing enforcement and voluntary adherence to high environmental standards.

With over 500 employees in Brazil spread across client sites and the company's headquarters, WSP Brasil is expecting 20% growth in 2024. The growth of activity in critical minerals, including lithium and

nickel, is also creating a boom. Mining companies are approaching consultants and engineers with sustainability in mind. Lucila Telles, country manager of WSP Brasil, said "For our Brazil operations, nearly 75% of our revenue is linked to global ESG targets, reflecting our long-term commitment to sustainability."

Another aspect of WSP's growth has been the integration of services, allowing clients to engage with the company across a range of different issues. Telles commented: "Clients are looking for a one-stop shop for consultations. Solutions across different disciplines must be interconnected and we provide integrated services in several areas, such as engineering services, tailing management, mine water, mine closure, risk assessment, social, environmental, permitting and remediation."

GE21 Consultoria Mineral, a Belo Horizonte-based mining consultancy, is also experiencing rapid growth, aiming for 15-20% this year, and is expanding its reach geographically and into different industries. Bernardo Viana, partner at GE21, said: "We have opened new exploration projects and are setting up a new office in southern Brazil in collaboration with several service providers."

Leveraging their experience in Brazil working with international clients, GE21 Consultoria Mineral is also expanding its operations across South America. Argentina is a market of interest, where GE21 is relocating staff and building a local presence, aiming to have 20 staff there by year's end. Viana said: "Argentina presents a good business opportunity due to the new government's focus on mining investment. We anticipate a boom in Argentina for at least the next three years and are eager to start our business there."

"The government is now paying more attention to the mining sector, ensuring that environmental impact studies are thorough, and compliance is strict. Additionally, the norm for waste classification is changing."

Flávio Vasconcelos, CEO, Hidrogeo Engenharia e Gestão de Projetos



"Brazil's abundant natural resources, such as sun, wind, biodiversity and water, make it a prime area for foreign investment in sustainable projects."

Lucila Telles, Country Manager, WSP Brasil



The consulting company works with clients across different commodities, including Lithium Ionic, for whom they recently prepared a Technical Report for their flagship Salinas lithium project in the past year. Regarding lithium in Brazil, Viana added: "The lithium market has been volatile, with companies losing about 50% of their stock value and lithium prices dropping. Despite this, major players are still investing in lithium projects in Brazil, indicating that these fluctuations might be market adjustments."

Hidrogeo Engenharia e Gestão de Projetos, also based in Belo Horizonte, is working on greenfield rare earth projects and brownfield projects for phosphate and niobium. The company, which specializes in waste and effluence management and environmental impact assessments, is seeing growth in demand for its services in these areas as mining companies increasingly focus on reusing their tailings waste and disposing of waste responsibly. Flávio Vasconcelos, CEO, commented: "The most significant challenge among our clientele is managing the leaching of salts from rare earth mining operations, which can contaminate freshwater sources. This is incredibly challenging in Brazil due to heavy seasonal rainfall, which makes it difficult to contain the water within mining sites."

Vasconcelos also commented on the regulatory component: "While the laws themselves have not changed, enforcement has increased. The government is now paying more attention to the mining sector, ensuring that environmental impact studies are thorough and compliance is strict."

SRK Brasil is also experiencing significant growth and hiring new, qualified personnel to meet this new wave of demand. Thiago Toussaint, managing director of SRK Brasil, said: "We are seeing in Brazil a strong movement towards critical minerals. Copper and gold have been solid; lithium, rare earths and nickel are also very active," and that at the same time, "The National Mining Agency recently updated legal requirements for mine closure, which is also pushing mining companies towards a more sustainable scenario."

AtkinsRéalis has over 1,000 employees in Brazil, spread across client sites and offices in Belo Horizonte, Vitória, and Paraúpebas. Discussing AtkinsRéalis' work with different Brazilian miners, Maria de Lourdes Bahia, VP of M&M Latam for the company, commented, "We also collaborated with Vale on the world's first briquette plant in Vitória, launched at the end of last year. We continue to support Vale in developing new briquette plants globally."

As Brazil's mining sector diversifies, AtkinsRéalis is establishing and growing its relationships with a wide range of miners, recently completing an NI 43-101 report for Lithium Ionic and working alongside Brazilian Nickel on their flagship Piauí Nickel project. Maria de Lourdes Bahia commented: "Our focus is on commodities

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"In Brazil, the focus areas for decarbonization are the mining fleets and leveraging renewable energy sources like solar, wind and hydropower. We are also optimizing mine layouts to reduce reliance on trucks and enhance material handling via conveyor systems."

Andrew Roy,
President Latam,
Worley



essential to electric vehicles and sustainable mining, including iron ore, lithium, rare earths, and copper."

ERM: Environmental Resource Management, an environmental consulting firm, entered Brazil in 1993 and has nearly 500 employees in Brazil, with offices in São Paulo, Rio, Salvador, Belo Horizonte, and Porto Alegre, and works with major clients including Anglo American and BHP. The firm conducts ESG and climate risk assessments and risk assessments for contaminated sites. Ricardo Camargo, partner at ERM, said: "Investment banks increasingly seek compliance not just with local regulations but accordance with international best practices, as for instance the IFC Standards."

This year has also been busy at CLAM Meio Ambiente, the Belo Horizonte-based environmental consulting firm. The firm is active in projects across different commodities and is working with Vale on a forest regeneration project in northern Brazil. José Cláudio Nogueira Vieira, director of CLAM Meio Ambiente, discussed how the company uses advanced technology, including drones, in this task. In addition, Vieira mentioned how CLAM Meio Ambiente is developing environmental reports with the Brazilian Stock Exchange (B3). Discussing the increase in environmental standards in the industry, Vieira said: "We are helping our clients with GRI protocols and the new TSM Protocol that the Mining Association of Canada

"The government should support the development of the private market step-by-step. If private companies can develop projects independently, with minimal government interference, Brazil can become a significant player in the rare earth market in the next few years."

Bernardo Viana, Partner,
GE21 Consultoria
Mineral



(MAC) introduced last year with IBRAM's support."

The importance of meeting international standards is highest for the various junior companies pursuing projects in Brazil and battling for financing. This demand has driven much business for Ausenco. Leonardo Pena, VP of Ausenco Brasil said: "We focus on supporting junior companies in their early stages, not just from an engineering perspective but by understanding the business and signing off on necessary reports for the TSX."

For Allonda, an environmental engineering services and consulting company, decarbonization commitments by mining industry players are driving demand. Leo Melo, CEO of Allonda, commented: "Following disasters like Mariana and Brumadinho, mining companies now focus on minimizing operational costs, adapting to climate change, and achieving decarbonization goals driven by investor expectations."

Ana Paula Spolidoro Queiroz, general manager of Waterloo Brasil Consultoria Ambiental, an environmental consultant, added: "After these events, environmental agencies became more vigilant and started requiring extensive safety studies for mining operations. This heightened scrutiny has resulted in significant work for environmental consultants as companies strive to comply with these new requirements." ■



Equipment and Technology

Boom times for Brazil's mining industry providers

Equipment, service, and technology providers serve as the mining industry's barometer, showcasing the Brazilian mining sector's resilience and growth. The sector also benefits from Brazil's broad industrial base, which sets it apart from the other major Latin American mining markets. This industrial history and skilled workforce are crucial, enabling the application of technology developed in other sectors, which, in turn, benefits from the existence of technology clusters in the country.

Guillaume Barrault, CEO of Dynamox, a market leader in wireless condition monitoring solutions in Latin America, said: "Building a company in Brazil presents unique challenges due to the demanding business environment. However, we benefit from access to highly skilled engineers and a rich talent pool."

Hexagon, which offers integrated technological solutions to the mining industry, is at the forefront of companies introducing digital autonomous technologies for the mining sector. As companies in the industry seek to drive productivity, increase efficiency, and meet sustainability targets across their ESG commitments, data-driven solutions are being implemented. Rodrigo Couto, president Latam of Hexagon, said: "Major players like Vale are now seeking technology integrators who can deliver comprehensive solutions across various platforms, increasing productivity and efficiency rather than relying on single OEM suppliers."

The need for agnostic solutions is paramount as companies seek to unify their operations across the board, regardless of the legacy physical equipment on site. Hexagon's integrated approach, called the 'Power of One', seeks to deliver this. Rodrigo Couto continued: "One significant advantage of this work is the retrofitting of older trucks with our autonomous and semi-autonomous solutions. Our agnostic approach allows us to extend the life of existing assets, reducing the need for clients to purchase new trucks."

A significant development in the technology sector for the mining industry has been the integration of Modular Mining Systems into Komatsu, which now operates as a vertically integrated business unit within Komatsu. Modular Mining Systems' principal efforts are focused on the rollout and application of their Intellimine Synergy platform, Komatsu's flagship agnostic solutions product. The

company is working closely with various partners, including collision avoidance systems providers, to enhance their product offering. Jose Airtton Sena, General Manager of Komatsu- Modular Mining Systems Brazil, said: "Our open platform addresses the need for interoperability, allowing different systems to work seamlessly. This platform integrates various applications into a unified layer for data exchange."

One of the far-reaching implications of these technological solutions for the sector will be their impact on the nature of the mining workforce. Throughout GBR's conversations with mining industry leaders across the value chain, labor availability and skill gaps have been identified as common concerns, the result of a red-hot labor market, decreasing appetite from younger generations to work in remote mining operations, and the ageing profile of much of the mining workforce. Sena from Komatsu- Modular Mining Systems Brazil argues: "Attracting people to work in remote locations like Carajás is increasingly difficult. Our solutions help address this issue by reducing the need for on-site labor through automation... Remote operation, like our T-Remote dozer system, allows operators to work from cities, making it more attractive to potential employees."

Taking advantage of mining diversification

As mining investments have entered Brazil and new operations advance, demand for equipment is growing. The growth of activity in northern Brazil in particular presents a boon for equipment providers, who are allocating resources to establish bases in Pará state and be closer to customers. Komatsu, which provides a suite of surface mining and underground equipment to the industry, has been at the forefront of this growth; as Ricardo Alexandre Santos, vice president of the mining equipment division at Komatsu, explained: "The mining business at Komatsu has grown significantly. In 2017, we had about 400 employees; by 2024, that number has increased to over 1,500."

The company's growth is a testament to the boom in mining activity in Brazil, and they are investing over R\$200 million to expand their operations in northern and central Brazil. Komatsu decided not to sell equipment through a third-party vendor, a standard model in



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many mining markets, prioritizing proximity to their customer base, highlighting the importance of the Brazilian mining market for one of the world's most significant mining equipment providers. A vital part of this growth has also been increased demand for sustainable solutions from customers, and Komatsu is taking action, tailoring products for the Brazilian market. Ricardo said: "We are working on projects to create hybrid trucks utilizing multiple energy sources, including ethanol, which can significantly cut CO2 emissions."

Minax, a Minas Gerais-based equipment, personnel and service provider, has 40 years of history providing drilling, excavation, transportation, and earthmoving and rental equipment, and is well adapted to meet the surge in demand for its services. Victor Hugo, director of Minax, said companies increasingly opt to rent equipment: "This trend is especially strong in Brazil's northeast and north regions, where many companies opt to rent equipment rather than purchase it outright. This shift is driven by cost considerations and the need for flexibility, as companies prefer to rent based on

immediate needs rather than incurring the expense of purchasing equipment."

Another primary equipment provider strategically investing in northern Brazil is Correias Mercúrio, a Brazilian manufacturer providing conveyor belts for mining and other industries. Leonardo Sales, CEO of Correias Merúrio, discussed the company's manufacturing base in the north: "The Marabá factory, completed in 2016, recently expanded its capacity by 50%. This factory focuses on heavy-duty belts for mining, but we also produce lighter belts for agribusiness. Being close to our clients is crucial. For example, delivering a belt to clients from São Paulo to Pará takes about 12 days by road, while from Marabá, it takes only 24 hours."

TAKRAF do Brasil, a prominent German equipment provider of crushing, processing and transportation solutions to mining clients, entered the Brazilian market in 2000 through a contract with Vale. The company benefits from Brazil's industrial base, utilizing local partners as it does not have its own fabrication base in-country. TAKRAF has been delivering projects incorporating

sustainability principles on a recent contract with the Port of Tiplam, Brazil's largest by capacity, as Tiago Carvalho, managing director of TAKRAF do Brasil, discussed: "We provided a solution incorporating a tube conveyor. Unlike traditional conveyors, which are open-belt designs, the tube conveyor is fully enclosed. This design mitigates environmental impact by preventing wind from spreading materials in sensitive areas."

The company is also leading the way in dry stack tailings management solutions, which are crucial for an industry that has undergone enormous change under regulatory pressure following the disasters at Mariana and Brumadinho. Carvalho continued: "We supplied Usiminas with a complete tailings processing plant. This included a filter press, conveyors to receive the discharge, and a thickener for processing. This project was the first DST solution implemented in Brazil, and it is now considered a benchmark for the industry."

Another company contributing to the industry's management and elimination of tailings dams is Huesker South America. The company makes products for soil reinforcement, drainage solutions, and overall improvement solutions, identifying a niche in the mining sector for their 'SoilTan' geosynthetic bags. André Estêvão Silva, managing director of Huesker South America, said: "One specific solution we offer is synthetic bags and textile containers for tailings storage, which are becoming increasingly in demand due to regulatory and environmental concerns."

AECI Mining, the South African blasting and chemicals company, entered the Brazilian market in 2020, establishing an explosives factory in the state of São Paulo and, in 2023, expanding through M&A to operate in the strategic mining regions of Minas Gerais and Bahia. The company is targeting South American markets for further growth as their core South Africa market matures, and it has rapidly established relationships with gold and iron ore producers in Brazil. Carlos Goncalves, managing director Latam for AECI Mining commented: "Entering Brazil came with its own challenges due to complex regulations and taxes. We adopted a cautious approach by acquiring a small explosives facility, allowing us to gradually understand local market dynamics."

Brazil is a significant hub for Aggreko, a power generation and temperature control provider generating approximately

"We have introduced the 'Green Cubes' initiative to the mining industry, a metric to measure environmental impact by digitally mapping biodiversity before and after operations."

Rodrigo Couto,
President Latam,
Hexagon



US\$250 million in revenue and with 400 megawatts installed in the country. The company has over 600 employees in Brazil but lacks a manufacturing center here. Brazil is also home to Aggreko's largest project worldwide, a diesel power generation contract in the Amazon region. Marco Contin, president of Aggreko Brazil, discussed the complexities of operating in that environment: "We undertook our first project in the Amazon, which involved sourcing equipment, acquiring land, and ensuring compliance with environmental standards. It is crucial to navigate land ownership complexities, where a single property can have multiple owners."

Contin also discussed how privatization efforts in Brazil's energy sector have led to and encouraged more investments in infrastructure upgrades, leading to electrification rates of 70%, a remarkable metric given the scale and remoteness of much of the country, and a testament to the country's solid fundamentals for mining investments. Discussing the increasing sustainability commitments of companies across the sector, Contin said: "Four years ago, most of our business focused on diesel generation. Now, approximately 70-80% is shifting toward gas and renewable energy. We are currently looking at solar power projects in Brazil, aiming for substantial generation capacities."

Another leading power provider for the mining industry is TSEA energia, a company that serves the power generation, transmission, distribution and industrial markets. Until 2018, it was Toshiba South America, when it was acquired by Brazilian private equity investors FRAM Capital following Toshiba's divestment from Brazil. TSEA energia has a large manufacturing footprint in the country, with factories in Contagem, Betim and Curitiba, serving various industries, from pulp and paper to mining. Regarding TSEA energia's exposure to mining operations, Rafael Porteiro, business development & marketing director at TSEA energia discussed their collaboration with gold, iron, and increasingly lithium players, saying: "In recent years, we have seen significant growth in the lithium sector pushed by the EVs, particularly in the Vale do Jequitinhonha region, which has become a hub for lithium exploration, and it is in the same state that we have our operations, Minas Gerais. This has created new opportunities for us to supply equipment and services to companies in this sector."

Core Case is a relative industry newcomer and a recent success story among Brazilian equipment providers. The company, founded in 2010, produces specialized storage equipment for drill core samples. Over the past year, Core Case has focused on integrating more technology into its products, including enhanced tracking technology and RFID and QR code tags to monitor cases from site to warehouse. Daniel Bortowski, director of Core Case, said: "We want

to replicate our success in Brazil in markets like Canada, leveraging our successful products and new technology-driven products like the Smart Case to achieve this."

Brazil also serves as Metso's hub for other South American markets, reaffirming its industrial fundamentals. Metso has been in the country for over 100 years and has more than 2,000 employees. Its physical footprint includes a castings foundry, crusher and screen factories at Sorocaba, which serve as production hubs for other regional markets. Metso is strengthening its capabilities in flotation and filtration solutions, which are vital for the Brazilian market. Marcelo Motti, VP for Metso Brazil, discussed how the mining sector's growth in the past year, underpinned by high iron and gold prices and incoming and developing lithium and rare earth projects, can be difficult to manage: "One of the primary challenges is finding competent professionals. Attracting skilled engineers and professionals remains difficult. Additionally, Brazil's high cost of capital, driven by high interest rates, poses a significant hurdle."

Valmet, the Finnish provider of flow control solutions, valves and pumps, also has a production unit in Sorocaba to assemble and test valves, as well as a strategic supply centre with products and components. Valmet's mining business is growing, and the company is prioritizing sustainability and digitization to cement its market position. Fabio Maia, vice-president of the flow control business line at Valmet South and Central America, said: "We develop products designed to prevent gas leaks and reduce energy consumption. For instance, our valves are engineered to minimize CO2 emissions, and our supply chain partners must adhere to stringent ESG policies."



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"Companies spend millions of dollars on research and drilling, but often do not store samples properly. A drilling sample can be as valuable as a luxury apartment and can contain invaluable data, yet it is frequently stored haphazardly."

Daniel Bortowski,
Director, Core Case



Similarly, for Neuman & Esser, which provides compressors, process solutions and hydrogen generators for various industries, including mining, Brazil acts as a regional hub, from which it can serve the Latin American market. The German company is expanding in Chile and recently announced investments as it expands its green hydrogen generation business across South America. The focus is on decarbonization solutions, as Rafael Serpa, sales and application manager from Neuman & Esser commented: "We are expanding our facilities in Belo Horizonte, quadrupling our assembly area, and in São Paulo, our R&D hub, to support decarbonization initiatives, collaborating closely with local industries to promote sustainable practices." ■



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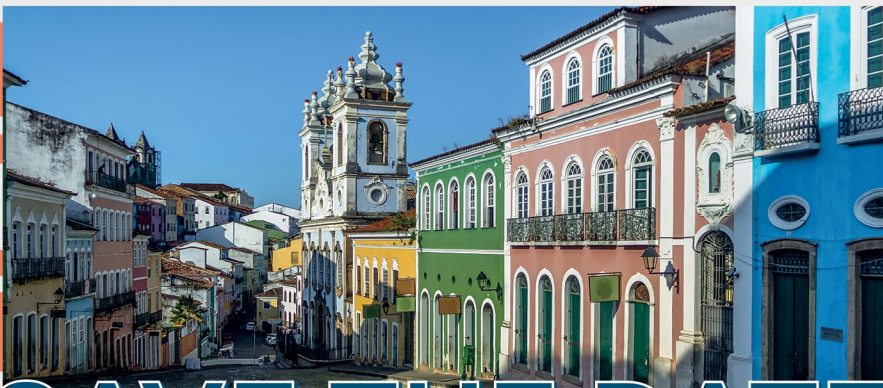
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