U.S. Chamber of Commerce

Brazil-U.S. Business Council

AMCHAM Brazil

Economic Impacts of Expanded Investment in Brazil's Critical Minerals and Rare Earth Elements Value Chain

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Executive Summary of Key Findings

The global energy transition is redefining the strategic role of critical minerals and rare earth elements in the global economy. Technologies such as high-capacity batteries, electric vehicles, wind turbines, and advanced energy storage systems increasingly depend on secure, resilient supply chains for minerals such as copper, graphite, lithium, nickel, and rare earth elements.

Brazil holds significant competitive advantages and boasts some of the world's largest and highest-quality reserves of these critical resources. However, it currently participates in global value chains primarily as an upstream supplier of raw materials, with limited domestic processing, industrial vertical integration, and value addition. There is a substantial opportunity to unlock mutual economic growth through greater integration.

In this context, the U.S. Chamber of Commerce, in partnership with AmCham Brazil, has conducted a comprehensive study on the economic impacts of expanding private sector investment in Brazil's critical minerals and rare earth elements value chains between 2026 and 2050. This study assesses not only the effects of increasing raw mineral production but, crucially, the compounding economic multiplier effects associated with domestic processing, advanced manufacturing, and strategic partnerships with U.S. and foreign capital.

Strategic Context and Baseline Assumptions

The prospective scenarios in this report are grounded in a robust review of technical data and official sources, including the National Mining Agency (ANM), the Ministry of Mines and Energy (MME), the Brazilian Institute of Geography and Statistics (IBGE), the Brazilian Center for International Relations (CEBRI), and the International Energy Agency (IEA).

The study focuses on the value chains for copper, graphite, lithium, nickel, and rare earth elements—resources whose demand will surge exponentially through 2050 as the global economy electrifies and pursues decarbonization targets. By 2050, projected cumulative demand includes:

- 1.6 million metric tons of graphite
- 894,000 metric tons of copper
- 133,000 metric tons of lithium
- 117,000 metric tons of nickel
- 12,800 metric tons of rare earth elements

Between 2026 and 2030, a projected US$20.5 billion in critical minerals investment is slated for Brazil, centered in the states of Pará, Bahia, Goiás, Minas Gerais, and Piauí. These investments anchor two simulated scenarios representing the expansion of Brazil's productive capacity.

In the high-growth scenario, the study assumes greater participation by foreign direct investment (FDI) to finance market-driven projects. The share of foreign capital increases from approximately 4% to 15%. This assumption reflects a more predictable, pro-growth business environment that attracts international investment, supported by robust risk mitigation tools, sensible regulatory frameworks, and private-sector-led innovation. It envisions a future where an increasing share of mineral production supplies domestic industrial operations, driving midstream processing and manufacturing.

Methodology and Scenarios

Economic impacts were estimated using an interregional Computable General Equilibrium (CGE) model—an internationally recognized methodology for evaluating large-scale capital investments and public policies.

- **Scenario 1 (Baseline Extraction)**
  Expansion of mineral production financed primarily by domestic capital and directed toward raw exports. The current value chain profile is maintained, capturing limited downstream value addition.
- **Scenario 2 (Deep Value Chain Integration)**
  Projected domestic investments are mobilized alongside increased Foreign Direct Investment (FDI). Greater volumes of extracted minerals are utilized as inputs by domestic industry, expanding downstream processing, advanced manufacturing, and integration into global clean energy supply chains.

Key Findings and Economic Imperatives

Expanding capital investment in critical minerals generates positive economic impacts under both scenarios. However, the economic dividends are exponentially greater when the market expands domestic processing and leverages the expertise, technology, and capital of international investors.

Key Results

The results show that expanding investment in critical minerals generates positive economic impacts under both scenarios, but the impacts are significantly greater when the country expands domestic mineral processing and attracts international investment.

Table 1. Investment and production scenarios for strategic critical minerals: cumulative macroeconomic impact, 2026–2050

Macroeconomic Indicators	Scenario 1		Scenario 2		Value Chain Deepening Effect
	Variation	BRL$ billion	Variation	BRL$ billion	BRL$ billion
GDP	1.1%	128.7	1.64%	192.1	**63.4**
Consumption	0.3%	22.4	0.73%	54.6	**32.3**
Investment	5.24%	104.8	6.04%	120.9	**16.1**
Exports	1.1%	23.3	1.27%	27.0	**3.7**
Employment	0.29%	304,000 jobs	0.71%	750,000 jobs	**446,000 jobs**

Source: U.S. Chamber and AmCham Brazil Analysis

The deep value chain integration (Scenario 2) delivers massive premiums to the Brazilian economy, including:

- BRL $63.4 billion (approximately USD 12.4 billion) in additional GDP growth.
- BRL $32.3 billion (approx. USD 6.3 billion) in expanded household consumption.
- BRL $16.1 billion (approx. USD 3.2 billion) in new private sector investment.
- BRL $3.7 billion (approx. USD 725 million) in higher-value exports.
- 446,000 new, high-quality jobs.

Regional and Sectoral Impacts

While extraction investments are concentrated in Pará, Bahia, Goiás, Minas Gerais, and Piauí, the shift toward domestic processing diffuses economic benefits nationwide. Value chain acceleration is particularly pronounced in industrialized states like Santa Catarina, Minas Gerais, São Paulo, and Paraná. This demonstrates a vital free-market principle: moving up the value chain lifts the broader economy, spurring growth in manufacturing, tech, and specialized services.

Table 2. Investment and production scenarios for strategic critical minerals by state: cumulative GDP impact, 2026–2050

State	Scenario 1	Scenario 2	Value Chain Deepening Effect
Pará	16.0%	16.0%	**0.0%**
Bahia	9.9%	10.3%	**0.5%**
Goiás	9.8%	10.0%	**0.2%**
Piauí	4.0%	4.0%	**0.0%**
Minas Gerais	3.1%	3.8%	**0.8%**
Santa Catarina	0.0%	1.3%	**1.2%**
São Paulo	0.0%	0.7%	**0.7%**
Paraná	0.1%	0.7%	**0.6%**
Rio Grande do Sul	0.0%	0.3%	**0.2%**
Rio de Janeiro	0.1%	0.2%	**0.1%**
The rest of Brazil	0.0%	0.4%	**0.4%**
Brazil	**1.1%**	**1.6%**	**0.5%**

Source: U.S. Chamber and AmCham Brazil Analysis

Within the manufacturing sector, the windfall is concentrated in the production of electrical machinery and equipment linked to batteries and electric mobility, followed by the automotive and heavy machinery industries. This underscores that the industrialization of critical minerals is a catalyst for broad-based advanced manufacturing competitiveness.

Table 3. Investment and production scenarios for strategic critical minerals in the main sectors: cumulative GDP impact, 2026–2050

Economic Activity	Scenario 1	Scenario 2	Value Chain Deepening Effect
Construction	3.8%	4.5%	**0.7%**
Mining and quarrying industries	4.0%	4.2%	**0.2%**
Manufacturing industries	0.6%	1.8%	**1.2%**
Information and communication	0.9%	1.1%	**0.9%**
Professional, scientific and technical activities	0.7%	1.2%	**0.3%**

Source: U.S. Chamber and AmCham Brazil Analysis

Final Considerations

Brazil has a distinct strategic window to cement its position not just as a supplier, but as a central hub in the global critical minerals value chain. Realizing this potential depends on expanding extraction while simultaneously building a business environment that attracts U.S. and international capital to drive midstream and downstream industrial development. Embracing free enterprise, regulatory certainty, and deeper commercial ties will maximize economic growth, job creation, and long-term competitiveness in the energy transition.

Introduction

Addressing global energy and climate challenges requires a coordinated, market-driven global effort. As the world accelerates the adoption of low-carbon technologies—from renewable generation and energy storage to broad economic electrification—the demand for strategic resources will scale dramatically. Clean energy infrastructure relies on complex, material-intensive supply chains. An onshore wind farm requires nine times the mineral resources of a natural gas plant, and an electric vehicle uses six times the mineral inputs of a conventional automobile. For U.S. businesses operating across clean energy, advanced manufacturing, and defense supply chains, these material requirements directly translate to both critical supply chain vulnerabilities and immense commercial opportunities.

The relationship between the energy transition and the mineral economy is central to global strategic competition. According to the International Energy Agency (IEA), clean energy technologies have driven up to 90% of the recent demand growth for minerals like lithium, cobalt, and nickel. Yet, current global supply chains remain heavily concentrated in a small number of processing nations, elevating supply security to the top of U.S. industrial and national security agendas.

To mitigate these vulnerabilities, the United States has prioritized the diversification of critical mineral supply chains through robust industrial policies—such as the Inflation Reduction Act and the CHIPS and Science Act—as well as bilateral mineral security partnerships. Diversifying away from single-source dependencies is a strategic necessity, and Brazil has emerged as a premier partner in this endeavor.

In Brazil, the mining industry serves as a foundational pillar of economic prosperity, contributing approximately 4% of GDP and generating a substantial trade surplus. In 2024, the sector drove BRL $270.8 billion in revenue, with mineral exports accounting for 47% of the national trade surplus. These figures highlight an industry with massive scale, ready to absorb and compound additional private capital—including from U.S. investors.

A material is classified as “critical” based on its economic importance combined with the risks associated with its supply (CEBRI et al., 2025). A mineral, in turn, is considered “strategic” when a country holds comparative advantages and reserves that serve sectors with strong domestic or international demand (EPE, 2025). Brazil maintains an official list of strategic minerals, established under Resolution No. 2/2021 of the Ministry of Mines and Energy (MME, 2025), which includes copper, nickel, niobium, graphite, lithium, and rare earth elements (REEs). The country holds leading positions globally, with the world’s largest niobium reserves, the second-largest graphite reserves, and the third-largest reserves of nickel and rare earth elements (MME, 2026). Critically, these are not speculative deposits; they are proven, large-scale reserves for resources where global commercial and industrial demand is projected to quadruple by 2040.

However, Brazil’s mining sector remains heavily concentrated in the upstream extraction and early midstream phases, with limited integration into high-value downstream manufacturing. For example, in 2023, only 5% of Brazil’s extracted lithium was processed domestically, and refined nickel accounted for less than 40% of overall production. Consequently, Brazil functions primarily as a commodity exporter, often repurchasing the manufactured, value-added products—like batteries and electronics—derived from its own raw materials.

To capitalize on this potential, there is a distinct need for long-term strategic analysis connecting demand projections with macroeconomic forecasting. This study fills that gap by providing a comprehensive assessment of the economic effects of expanded critical mineral investment in Brazil. By evaluating extraction, processing, and downstream industrialization under two detailed general equilibrium scenarios, this report supplies actionable intelligence for investors, off-takers, and policymakers.

To this end, two investment and expansion scenarios for critical minerals and rare earth elements (CMREs) were developed:

Scenario 1 examines investments in critical minerals and projected expansions in Brazilian mineral production. Under this scenario, production is directed primarily toward exports and financed exclusively through domestic resources.

Scenario 2 examines projected growth in the domestic use of these minerals. Here, minerals are not only exported but increasingly used as inputs by domestic manufacturing sectors—particularly those linked to the energy transition and the Net Zero agenda. Investments under this scenario are financed through a combination of domestic and foreign capital.

From a methodological standpoint, implementing these scenarios required both adapting the data structure of the Computable General Equilibrium (CGE) model and compiling secondary data sources to determine each mineral type's relative share of production within the non-ferrous metallic minerals and non-metallic minerals sectors. This involved integrating multiple data sources (ANM, 2026; Brazil, 2026; CEBRI et al., 2025; IBGE, 2026), alongside estimates of direct demand growth through 2050 from battery, wind turbine, electric motor, and vehicle manufacturing sectors—based on the projections, classifications, and parameters established by CEBRI et al. (2025).

The results reveal a clear market reality: transitioning from raw commodity exporter to integrated, high-value participant in global clean tech supply chains is an economically compelling path for Brazil. Deepening U.S. commercial engagement is the critical catalyst to accelerate that transformation—and the processing gap is precisely where U.S. private sector technology, capital, and industrial expertise can deliver maximum value.

Projected Expansion of Critical and Strategic Minerals

2.1 Supply and Demand

The study by CEBRI et al. (2025) developed supply and demand estimates for critical and strategic minerals in Brazil based on the “Brazil Transition” scenario, which projects the accelerated adoption of low-carbon technologies to enable the country to achieve net-zero greenhouse gas emissions by 2050. As noted in the study itself, the estimated volumes are specific to the energy transition and represent net quantities for energy-related applications associated with energy conversion technologies, excluding other potential uses. Therefore, the estimates do not represent total demand for these minerals, but only the share most directly associated with the energy transition (CEBRI et al., 2025).

Table 5 presents these projections for six types of minerals (copper, graphite, lithium, nickel, cobalt, and rare earth elements [REEs]). The average annual growth rate for REEs such as neodymium (Nd), praseodymium (Pr), dysprosium (Dy), and gadolinium (Gd), taken together, is expected to reach 28.2% through 2050. By the end of the 2025–2050 period, projected demand for REEs is expected to reach a cumulative total of 12.8 thousand metric tons (kt) by 2050 (CEBRI et al., 2025). However, this volume is substantially lower than that projected for the other minerals (Table 5). In terms of tonnage, neodymium accounts for the largest share, representing nearly 80% of the total cumulative demand for these rare earth elements. These elements are used primarily in the manufacture of wind turbine generators and electric motors (CEBRI et al., 2025).

Table 5. Estimates of the supply and demand for critical minerals in Brazil, 2025–2050

Mineral	Copper	Graphite	Lithium	Nickel	Cobalt	Rare Earth
Production (2024 - Kt)	527	68	10	77	-	00.2
Accumulated Demand (2025–2025 - Kt)*	894	1600	133	117.2	17.4	12.8
Annual variation	2..%	12.9%	10.5%	1.6%	-	28.2%

Source: Developed based on results from CEBRI et al. (2025).

In contrast, projected demand for Graphite is the most significant in terms of volume. Demand for 1.6 million metric tons of graphite is expected to supply battery-related energy conversion technologies, representing an average annual growth rate of 12.92% over the period. By comparison, cobalt ore has not been produced in Brazil during the past three years, according to the latest ANM Statistical Yearbook (2026), which uses 2024 as its reference year. Brazil’s mineral processing industry imports this mineral, resulting in a trade deficit for cobalt products (ANM, 2025, 2026). For this reason, it is not possible to calculate the percentage increase in cobalt supply, despite a projected cumulative demand of 17,400 metric tons by 2050. Accordingly, cobalt ore was excluded from this technical study because no reference value exists for domestic supply volume in 2024. The estimated supply expansions for the remaining minerals constitute the primary basis for constructing the simulation shocks used in the two scenarios analyzed. To this end, four successive steps were followed:

1. Harmonization of mineral products with the products in the National Accounts System (SCN) maintained by the Brazilian Institute of Geography and Statistics (IBGE), which defines the sectoral structure of the CGE model's database. This correspondence was established using the updated concordance tables published by IBGE (2026), particularly those linking CNAE subclasses to SCN products. For example, these concordance tables indicate that the extraction and processing of copper, lead, zinc, and other ores are classified under the SCN product Non-Ferrous Metallic Minerals.

2. Identification of the relative share of each mineral in the gross value of production (GVP) of the corresponding SCN product. This analysis used data on both run-of-mine (ROM) production volumes and processed mineral output from the ANM statistical database (2026), which provides detailed information by mineral type, year, state, and other characteristics. These data were then harmonized with the corresponding SCN products defined by IBGE.

3. Allocation of the tonnage of each mineral relative to the total output of the corresponding SCN product for 2024. To assess potential distortions arising from the use of physical production volumes to allocate the GVP of SCN products, a similar exercise was conducted using payroll statistics from the Annual Social Information Report (RAIS) of the Ministry of Labor and Employment (Brazil, 2026) for the CNAE subclasses associated with the identified minerals. The underlying assumption was that payroll size, as a cost variable, is directly associated with the scale and production capacity of the mining establishments supplying these products. The comparison between the ANM (2026) and RAIS (Brazil, 2026) datasets produced satisfactory results.

4. Calculation of the relative shares of each mineral, based on physical production volumes (ANM, 2026). By weighting these relative shares using the cumulative supply growth projections from CEBRI et al. (2025), the projected supply growth rates for the corresponding SCN products were obtained, providing the appropriate inputs for the simulation exercises under both scenarios examined in this study. Table 6 presents the cumulative supply variation % for SCN products resulting from the expansion of each type of mineral.

Table 6. Cumulative supply variation for SCN products in Brazil

Mineral	SCN Product	Percent of SCN Production (2024)	Annual variation
Copper	Non-ferrous metallic minerals	33.9%	23.6%
Graphite	Non-metallic minerals	0.90%	20.4%
Lithium	Non-ferrous metallic minerals	1.7%	20.3%
Nickel	Non-ferrous metallic minerals	7.9%	4.1%
Rare Earth	Non-ferrous metallic minerals	0.02%	11.1%

Source: Developed using results of CEBRI et al. (2025), IBGE (2026) and ANM (2026).

Copper ore accounts for 33.9% of the production of Non-ferrous metallic minerals. Therefore, the projected 69.6% increase in the supply of this mineral translates into a 23.62% increase in the corresponding SCN product by 2050, making it the principal driver of growth in the supply of Non-ferrous metallic minerals.

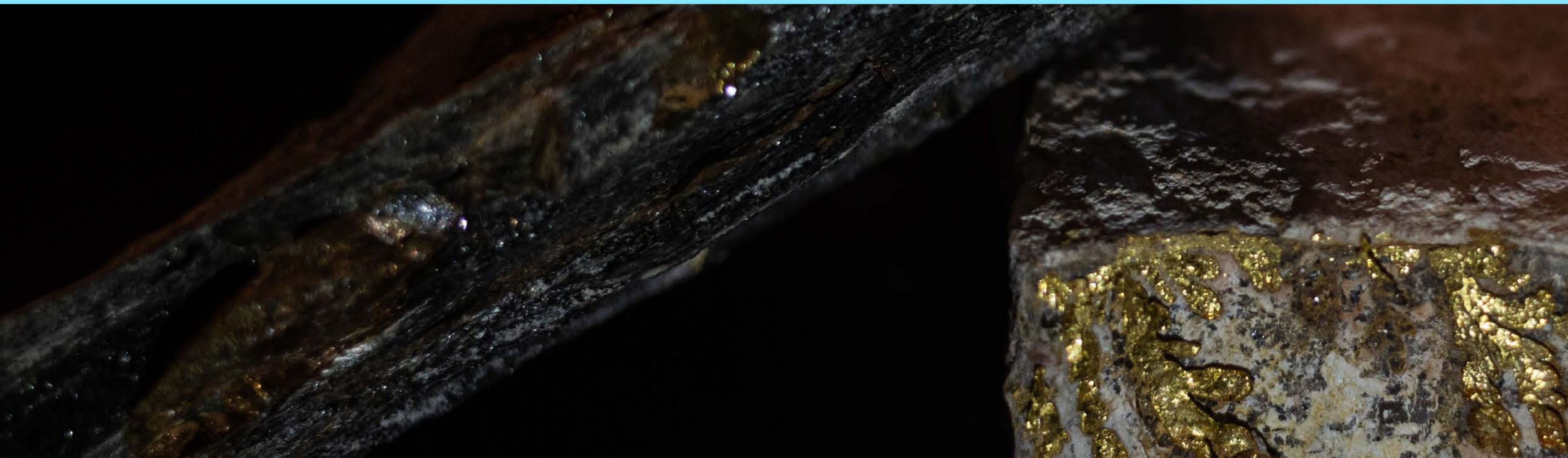
2.2 Use of Minerals in Value Chains

The study by CEBRI et al. (2025) also mapped the use of the net quantities of each mineral for energy-related purposes across the manufacturing processes of high-value-added products, that is, at the downstream stage of value chain integration. According to Table 7, demand for copper is concentrated primarily in batteries, which account for 75% of total cumulative demand, although it is also used in wind turbines and electric motors. For batteries, the estimate is based primarily on lithium iron phosphate (LFP) technology, with a material intensity of 0.45 kg/kWh. Under this scenario, the projected 684,000 metric tons of copper would correspond to approximately 1,520 GWh of cumulative battery capacity by 2050, covering not only fleet expansion but also battery replacement at the end of their service life. Assuming a replacement rate of 80%, close to the national average of 85.6% recorded in 2024, this would result in 5.06 million new vehicles, representing a 10.56% increase over the 2024 vehicle fleet. For onshore wind turbines, the projected volume would support the installation of approximately 23.8 GW of new generating capacity, equivalent to about 5,950 turbines. In the case of electric motors, the estimated demand of 141,000 metric tons includes both fleet expansion and equipment replacement, suggesting the addition of approximately 2.6 million electric motors by 2050.

Table 7. Cumulative variation for the expansion of SCN products, 2025–2050

Mineral	Use for production	Demand forecast for 2050	Variation for SCN product	SCN Product
Copper	Batteries	684 kf	7.2%	Electrical machinery, equipment, and appliances
	Wind turbines	69 kf	2.0%	Other mechanical machinery and equipment
	Electric motors	141 kf	0.7%	Other mechanical machinery and equipment
Graphite	Batteries	1600 kf	1.6%	Electrical machinery, equipment, and appliances
Lithium	Batteries	133 kf	24.5%	Electrical machinery, equipment, and appliances
Nickel	Batteries	116 kf	6.3%	Electrical machinery, equipment, and appliances
Rare Earth	Wind generators and electric motors	13 kf	1.4%	Other mechanical machinery and equipment
Vehicles Replacement rate of 80% batteries by 2050	-	5067 kf	10.6%	Automobiles, light -weight trucks and pick-ups

Source: Developed based on the results of CEBRI et al. (2025), IBGE (2026) and Brasil (2026).



In turn, graphite is expected to be used exclusively in the production of battery-related energy conversion technologies. Based on the technical parameters presented in the report by CEBRI et al. (2025), if all projected graphite demand is allocated to LFP batteries, the volume of 1.6 million metric tons would support a cumulative capacity of approximately 1,600 GWh (or 1.6 TWh), contributing 26 million new battery systems by 2050. Similarly, the projected 133,000 metric tons of lithium are expected to be used in the production of battery-related energy conversion technologies. Using a material intensity of 0.10 kg/kWh, 133,000 metric tons would support a cumulative capacity of approximately 1,330 GWh (or 1.33 TWh) by 2050 (CEBRI et al., 2025). By 2050, this would correspond to 22.1 million new battery systems, assuming an average battery capacity of 60 kWh. According to the International Energy Agency (IEA, 2025), lithium accounts for an average of 8.9 kg per electric vehicle.

The use of 1,400 metric tons of nickel is driven almost exclusively by batteries (99.2% of total demand). It is important to note that nickel is an essential component of NMC (Nickel-Manganese-Cobalt) and sodium-ion battery chemistries, whereas LFP (Lithium-Iron-Phosphate) batteries do not use this mineral. An average high-nickel NMC battery contains approximately 0.66 kg of nickel per kWh. Accordingly, dividing the projected demand of 116,000 metric tons (116 million kg) by the intensity of 0.66 kg/kWh indicates that this volume of nickel would support a cumulative capacity of approximately 175.8 GWh by 2050 (CEBRI et al., 2025), equivalent to 2.9 million new batteries.

The report by CEBRI et al. (2025) did not specify the end uses of the projected 12,800 metric tons of rare earth elements (REEs) through 2050. It only states that REEs are used in the manufacture of wind turbine generators and electric motors. The variation % for each SCN product serves as the basis for the simulation exercises conducted with the CGE model. In a subsequent stage, these end uses were harmonized with the corresponding SCN products, and the relative shares of payroll were used to weight the contribution of each manufacturing activity (e.g., batteries, turbines, energy conversion technologies, and electric motors), following the mapping developed by CEBRI et al. (2025), within the production of the corresponding SCN product. This procedure was similar to that adopted for mineral supply in the previous section.

2.3. Companies, Reserves, and Investment Projects

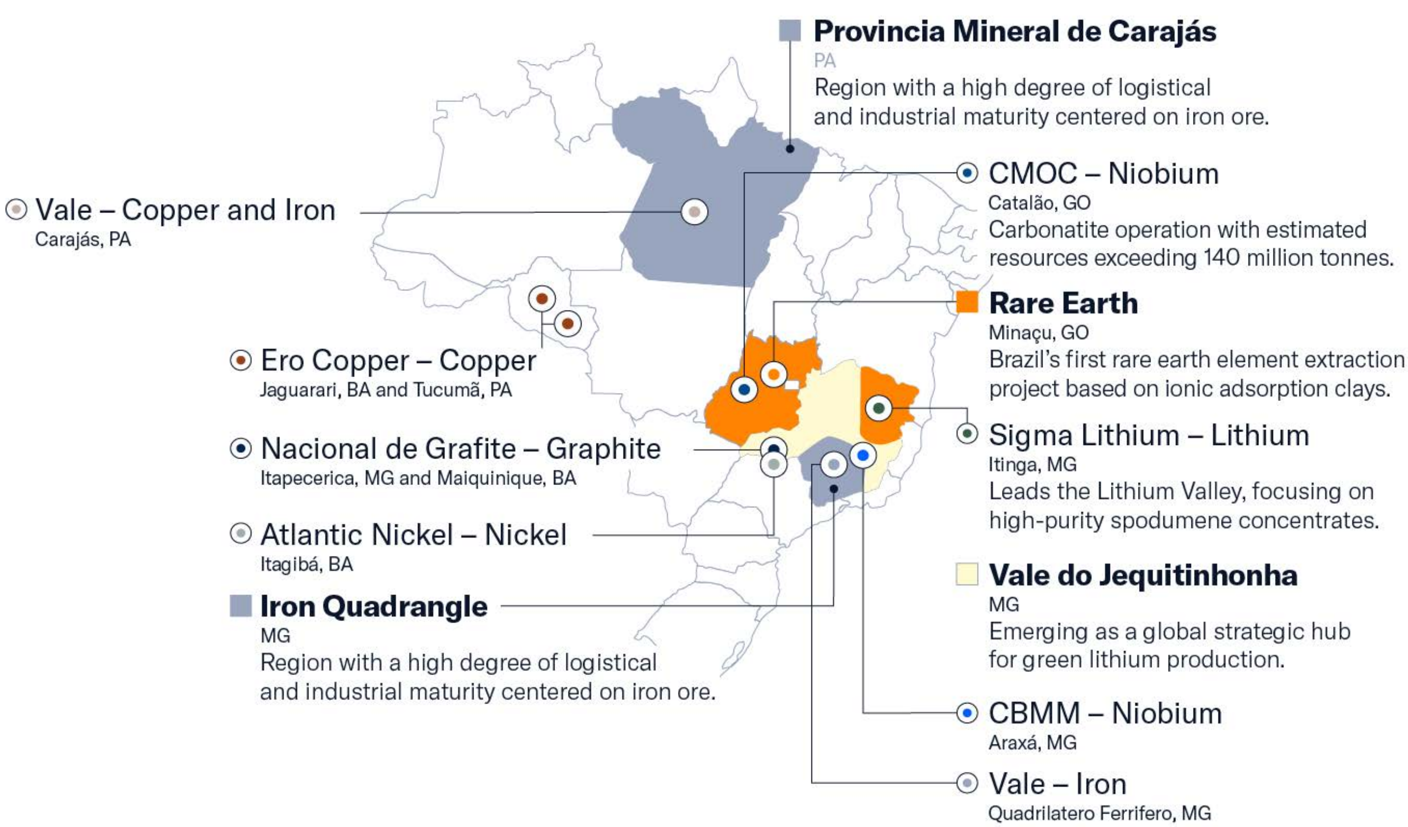
Production and investment projects are distributed across several mineral value chains, highlighting Brazil's significant position in the global supply of critical and strategic minerals (CSMs), particularly niobium, iron, graphite, and nickel. Brazil occupies a leading position in the global supply of critical minerals, especially with respect to its reserves of niobium, iron, graphite, and nickel.

In the graphite sector, the principal companies include Nacional de Grafite Ltda., with operations in Itapecerica, Pedra Azul, and Salto da Divisa; Grafita MG Ltda.; and Extrativa/Grafite do Brasil, in addition to the Santa Cruz and Peresópolis projects, which are associated with the projected cumulative demand of 1.6 million metric tons.

In the lithium value chain, concentrated in the Jequitinhonha Valley, the main operators include Sigma Lithium Resources, AMG, Companhia Brasileira de Lítio, and Lithium Ionic Corp, consistent with the projected cumulative demand of 133,000 metric tons through 2050 for battery-related energy conversion technologies (CEBRI et al., 2025).

In the rare earth elements (REE) sector, Mineração Serra Verde began operations in 2024 at the Pela Ema deposit in Minaçu (Goiás), producing neodymium, praseodymium, dysprosium, and terbium oxides, while Meteoric Resources NL, Viridis Mining, St George Mining, Aclara Resources, and Brazilian Critical Minerals continue to develop exploration projects. In the nickel sector, the principal companies include Vale Base Metals, MMG Limited, and Atlantic Nickel, with additional projects by Horizonte Minerals, Centaurus Metals, and Brazilian Nickel Ltda., associated with projected demand of 117,200 metric tons for energy storage systems. In niobium, global leadership is held by CBMM, which accounts for 80% of global production, together with CMOC International and Mineração Taboca. In copper, production is concentrated in the Carajás Mineral Province, where Vale S.A., Ero Copper, Lundin Mining Corp, and BHP Group Limited operate, serving projected demand of 893,900 metric tons for batteries, electric motors, and wind power applications. In iron ore, Vale S.A. accounts for 69% of production, alongside Anglo American, CSN Mineração, Samarco, Mineração Usiminas, and ArcelorMittal Brasil. In bauxite and aluminum, the principal companies are MRN, Alcoa Alumínio S.A., Norsk Hydro, and CBA (CEBRI et al., 2025). The complete list of companies and their locations is provided in Appendix 1.

Figure 1. Strategic Hub in the Global Critical Minerals Value Chain



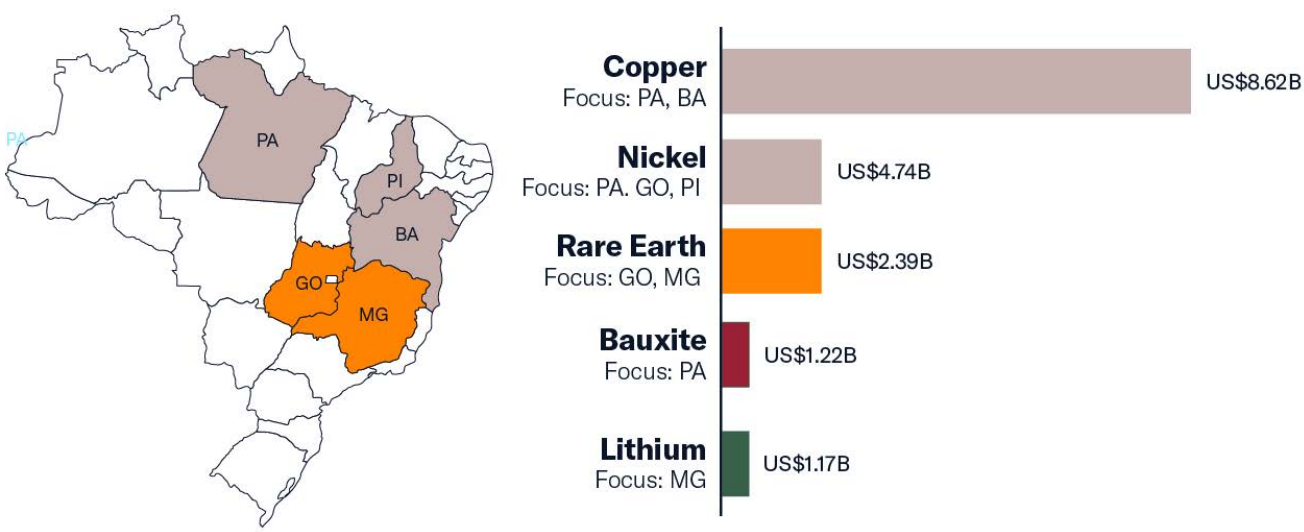
Source: CEBRI et al. (2025).

Taken together, these projects are concentrated primarily in the states of Minas Gerais, Pará, Goiás, and Bahia and indicate the potential for Brazil to expand its participation in the midstream and downstream stages of the mineral value chain. A comparison between the country's geological endowment and the cumulative demand associated with the energy transition through 2050 suggests reserve volumes well above the projected requirements for energy conversion technologies. Nickel reserves are estimated to be 128 times greater than projected demand, copper reserves 19 times greater, and graphite reserves 43 times greater. In the case of lithium, data from the Ministry of Mines and Energy indicate reserves of 1.37 million metric tons, increasing this ratio to approximately ten times the cumulative demand projected for the period (MME, 2026). This outlook is reinforced by Brazil's global position in mineral reserves, with the world's second-largest natural graphite reserves, representing 25.5% of global reserves, and rare earth element reserves estimated at 21 million metric tons, in addition to the country's third-place ranking in nickel reserves and seventh-place ranking in lithium reserves, at a time when global demand for minerals could quadruple by 2040 (IEA, 2025).

Based on the information compiled by CEBRI et al. (2025), planned investment in critical minerals for the 2026–2030 period totals US$20.50 billion, with the largest allocation directed to copper, totaling US$8.62 billion in Pará and Bahia, followed by nickel, with US$4.74 billion in Pará and Goiás, and rare earth elements (REEs), with US$2.39 billion in Goiás and Minas Gerais. These investments are complemented by US$1.22 billion in bauxite projects in Pará, US$1.17 billion in the lithium value chain in Minas Gerais, and US$2.34 billion in other mineral commodities across the states of Piauí and Bahia.

The implementation of these investments is associated with companies operating in specific geological provinces, including Vale S.A. and Ero Copper in copper, Vale Base Metals, MMG Limited, and Atlantic Nickel in nickel, Mineração Serra Verde, Meteoric Resources, and Viridis Mining in rare earth elements (REEs), Sigma Lithium, AMG, Companhia Brasileira de Lítio (CBL), and Lithium Ionic in lithium, and MRN, Alcoa, Norsk Hydro, and CBA in bauxite. Together, these investments have the potential to expand Brazil's productive capacity and strengthen the country's integration into the global value chains associated with the energy transition.

Figure 2. Regional distribution of projected investments, 2026–2030



Source: CEBRI et al. (2025).

Methodology

The methodology adopted (simulations using a CGE model) is based on scenario studies previously developed by the research team responsible for this study. The interregional Computable General Equilibrium (CGE) model is widely used in both the Brazilian and international literature to analyze sectoral and regional economic impacts (e.g., DOMINGUES et al., 2009; 2019). It is a recursively dynamic model designed to solve linearized equations expressed as growth rates, allowing for a consistent representation of the evolution of economic variables over time.

Its formulation incorporates equations describing supply, demand, and market equilibrium relationships, as well as mechanisms governing the interregional mobility of production factors and capital accumulation, thereby enabling the simulation of regional investment scenarios. This is the same class of model used by the World Bank, IMF, and major development finance institutions to evaluate large-scale investment programs —providing a rigorous, internationally recognized analytical foundation for the projections that follow.

Simulation Model Details

The Computable General Equilibrium (CGE) model used is of the Johansen type, whose mathematical structure is represented by a system of linearized equations, with solutions expressed as growth rates. This formulation follows the Australian tradition of Johansen-type general equilibrium modeling, particularly that of regional models in the TERM framework (Horridge, Madden, and Wittwer, 2005). In Brazil, this modeling tradition is well established and has been applied in models such as PAPA (Guilhoto, 1995), TERM-BR (Ferreira Filho, 1997), B-MARIA (Haddad, 1999), and their extensions, including SPARTA (Domingues, 2002) and BRIDGE (Domingues et al., 2010). More specifically, the model used in this study has the following theoretical specification:

- Households, production sectors, and investors choose between domestic and imported products based on a CES (Constant Elasticity of Substitution) structure, determined by the relative prices of products from different origins.
- Production sectors operate under constant returns to scale, using labor, capital, and land, with substitution among these primary factors also represented by a CES function.
- Households choose consumption goods according to a CES function and maximize utility through Klein-Rubin aggregation, such that consumption tends to track regional income.
- Investors select inputs for capital formation using fixed combinations of intermediate inputs, following a Leontief production structure.
- The model imposes market equilibrium conditions for domestic goods, imported goods, and factors of production in each region.
- Demand for transportation and trade margins is proportional to the associated flows of goods.
- The purchaser prices faced by producers, investors, households, exporters, and the government include basic prices, direct and indirect taxes, and trade and transportation margins.
- The mobility of production factors is imperfect across regions and sectors. As a result, an increase in labor demand in a given region may be partially constrained by rising local wages while simultaneously being accommodated by the migration of workers from other regions. Labor is fully mobile across sectors within the same region but only partially mobile across regions.
- The model's recursive dynamic structure causes investment and capital stock to follow accumulation and intersectoral reallocation mechanisms based on predetermined rules associated with depreciation and rates of return.
- Capital growth rates in industry depend on investors' willingness to supply capital, which is conditioned by the expected rate of return.
- The capital growth rate exceeds its steady-state path only when the expected rate of return is greater than the normal rate of return.

The model's database was updated through 2026 and organized into 125 sectors distributed across six regions—Pará, Bahia, Piauí, Minas Gerais, Goiás, and the Rest of Brazil—, ensuring a high level of analytical disaggregation. The model is implemented using the GEMPACK software package and exhibits considerable computational complexity, comprising approximately 70,000 equations, 33,000 variables, and roughly 300,000 numerical elements in its database. The results are expressed as percentage and monetary deviations, corresponding to the effects that the critical mineral production and investment scenarios exert on the trajectory of the Brazilian economy over a 25-year horizon.

The CGE model database was constructed using publicly available official secondary data sources, including the Input-Output Matrix, Supply and Use Tables (SUTs), foreign trade data (SECEX), employment statistics, RAIS, Regional Accounts, among others. This database integrated the mining sectors with the other productive sectors of the economy and enabled the simulation of investments in critical minerals and the expansion of mineral production. The impacts were estimated in both percentage and monetary terms, corresponding to the deviations that the critical mineral production and investment scenarios would generate relative to the baseline trajectory of the Brazilian economy over a 25-year period.

The methodology adopted was based on the construction of impact scenarios through model simulations. This approach made it possible to develop forward-looking scenarios for investment and production expansion while incorporating production linkages and multiplier effects. For this study, the model was calibrated using a macroeconomic, sectoral, and regional scenario disaggregated by state, covering the period from 2016 to 2025, which enabled the updating of the model's database. A baseline prospective scenario without mining investments was then developed, followed by the two investment and production scenarios for the selected minerals described previously. The analysis covers the 2026–2050 period, which is more consistent with expert projections for the expansion of global demand for critical minerals.

In addition, according to the Ministry of Mines and Energy (MME, 2026), planned investments in Brazil's mining sector total approximately US$77 billion through 2030. Business plans selected through a joint BNDES and FINEP call for proposals account for BRL$45.8 billion allocated to mineral processing and the deepening of industrial value chains. These projects are distributed across states including Minas Gerais, Pará, Bahia, Goiás, and Piauí and focus on lithium, copper, nickel, rare earth elements, graphite, and niobium. This substantial amount of BRL$45.8 billion, attracted through a single public call for proposals—which received 124 submissions and selected 56—demonstrates strong market interest and significant unmet demand for financing in the sector. The creation of the Strategic Minerals Private Equity Fund (FIP), launched through a partnership between BNDES and the MME, serves as a de-risking mechanism for private-sector investment. Brazil's sovereign risk premium, measured by the country's Credit Default Swap (CDS), declined by 521.36 points over the decade, reaching 138.32 basis points by the end of 2025, indicating improved conditions for project financing due to the lower cost of long-term capital required for new capital investment projects (CAPEX).

Brazil also seeks to attract international co-investment through ApexBrasil's efforts to promote investment opportunities and connect foreign partners with domestic projects. The participation of foreign investors is anticipated through capital structures such as private equity funds and BNDESPAR operations, which are intended to support mine development and the modernization of production capacity (MME, 2026).

However, neither the report by CEBRI et al. (2025) nor that of the MME (2026) provides projected amounts of foreign direct investment (FDI) for the critical and strategic minerals (CSM) sectors. According to the Central Bank of Brazil's 2023 Foreign Direct Investment Report (BCB, 2024), the metallic mineral extraction sector (which includes iron ore and most critical minerals) accounts for between 3.5% and 5% of the total stock of foreign capital invested in Brazil, with an average participation of approximately 4%. The extractive industry as a whole (including oil, natural gas, and non-metallic minerals) typically accounts for approximately 10% to 15% of annual foreign investment inflows, depending on global commodity price cycles (BCB, 2024).

Based on this evidence, this study assumes an increase in the share of foreign capital in the CSM sectors from 4% to 15%, under the assumption that, over the long term, these sectors will achieve a level of attractiveness to foreign investment comparable to the average for the broader extractive industry. This additional FDI is incorporated into scenario 2 of this study.

The results produced represent deviations relative to a baseline scenario without this expansion. The two scenarios have the following characteristics:

- **Scenario 1**
  Investments in critical minerals and projections for increased production in Brazil were considered. Under this scenario, the minerals are primarily destined for export, and investments are financed exclusively through domestic resources.
- **Scenario 2**
  Investments in critical minerals and projections for expanded production in Brazil were considered. The minerals are exported but are also used as inputs by domestic manufacturing sectors. To support this analysis, it was necessary to identify the sectors that use these minerals as production inputs, based on international references, such as the use of lithium in battery production, as discussed in Section 3.2 of this study. Changes in the level of activity of selected value chains resulting from the expanded supply of critical and strategic mineral inputs were allocated across the Brazilian regions represented in the CGE model according to the payroll distribution of the corresponding CNAE subclasses (Brazil, 2026). This additional procedure took into account not only the regional distribution of the production units within each sector benefiting from the increased mineral supply, but also ensured asymmetry in the percentage variations (simulation shocks) across the Brazilian regions represented in the CGE model. Investments are financed through both domestic and foreign resources, in previously defined volumes and proportions. The simulations include US$20.5 billion in domestic capital together with an 11-percentage-point increase in the share of foreign capital in the form of foreign direct investment (FDI), based on the references provided in the BCB (2024) report and the assumptions regarding foreign capital attractiveness presented in CEBRI et al. (2025) and MME (2026). Because this scenario involves a higher level of investment and greater expansion of production in domestic sectors, its effects on economic variables are greater than those observed under Scenario 1.

The figures on the following page schematically illustrate the expected economic effects of expanding investment in and production of critical minerals. During the initial construction or project implementation phase, the construction of new mining facilities or the expansion of existing mining operations is expected to stimulate demand for goods and services related to construction, machinery and equipment manufacturing, specialized services, and infrastructure. At this stage, the effects on income generation and employment are expected to be strongest, particularly in sectors directly associated with the implementation of the investments. In the subsequent operational phase, mineral production requires the continuous use of machinery, equipment, and services necessary to sustain mining activities. During this phase, the effects on employment and income are expected to be relatively smaller and more concentrated in the value chains directly involved in ongoing operations. This reflects the fact that mining is generally a capital-intensive activity, relying proportionally more on machinery, equipment, and infrastructure than on direct labor.

Figure 3. Schematic representation of the effects of investment

Figure 4. Impacts from investments and production

Results

The estimated results represent the cumulative impact, from 2026 to 2050, of the expansion of investment in and production of critical and strategic minerals on the growth trajectory of the Brazilian economy. Analytically, this means that the reported values do not represent absolute levels but rather deviations relative to a baseline scenario in which these investments are not implemented and the projected expansion of mineral production does not occur. As such, they make it possible to measure the additional contribution of the development and value chain deepening of these mineral industries to the country's economic performance over the period analyzed. The methodology employed integrally captures both the direct effects – associated with project implementation, increased mineral production, and the immediate demand for inputs, machinery, equipment, and services – and the indirect and induced effects resulting from intersectoral linkages, income generation, increased household consumption, expanded aggregate investment, and stronger regional economic activity. As a result, the study provides a comprehensive and consistent analytical assessment of the potential impacts of this mineral development agenda on the macroeconomic, sectoral, and regional dimensions of the Brazilian economy.

4.1 Overall Results for Brazil

The results presented in the table below show that, under Scenario 1, the expansion of investment in and production of critical and strategic minerals generates a cumulative macroeconomic impact of 1.10% on GDP between 2026 and 2050, equivalent to BRL$128.66 billion. Household consumption increases by 0.30%, corresponding to BRL$22.35 billion, while investment records the largest relative increase, growing by 5.24%, equivalent to BRL$104.78 billion. Exports increase by 1.10%, representing BRL$23.28 billion, while employment expands by 0.29%, resulting in approximately 304,000 additional jobs.

Under Scenario 2, the effects are stronger across all variables considered, reflecting not only the expansion of mineral production but also the use of these minerals as inputs in domestic value chains and the participation of foreign financing. In this scenario, GDP increases by 1.64%, equivalent to BRL$192.07 billion; household consumption rises by 0.73%, or BRL$54.63 billion; investment increases by 6.04%, corresponding to BRL$120.87 billion; and exports grow by 1.27%, representing BRL$26.95 billion. Employment, in turn, increases by 0.71%, generating an estimated 750,000 additional jobs. The near-doubling of job creation — from 304,000 to 750,000 — and the step-change in GDP impact underscore that the economic case for value chain deepening is not marginal; it is transformative.

Finally, the local value chain development corresponds to the difference between the results of Scenario 2 and Scenario 1 (i.e., C2 − C1), making it possible to isolate the additional gains associated with greater domestic value addition and stronger domestic integration of mineral value chains. This additional effect amounts to 0.54% of GDP (BRL$63.41 billion), 0.43% of household consumption (BRL$32.27 billion), 0.80% of investment (BRL$16.09 billion), 0.17% of exports (BRL$3.67 billion), and 0.42% of employment (446,000 additional jobs). Put differently: the incremental value of foreign investment participation and domestic processing—over and above extraction alone—is BRL$63.4 billion in GDP and 446,000 jobs.

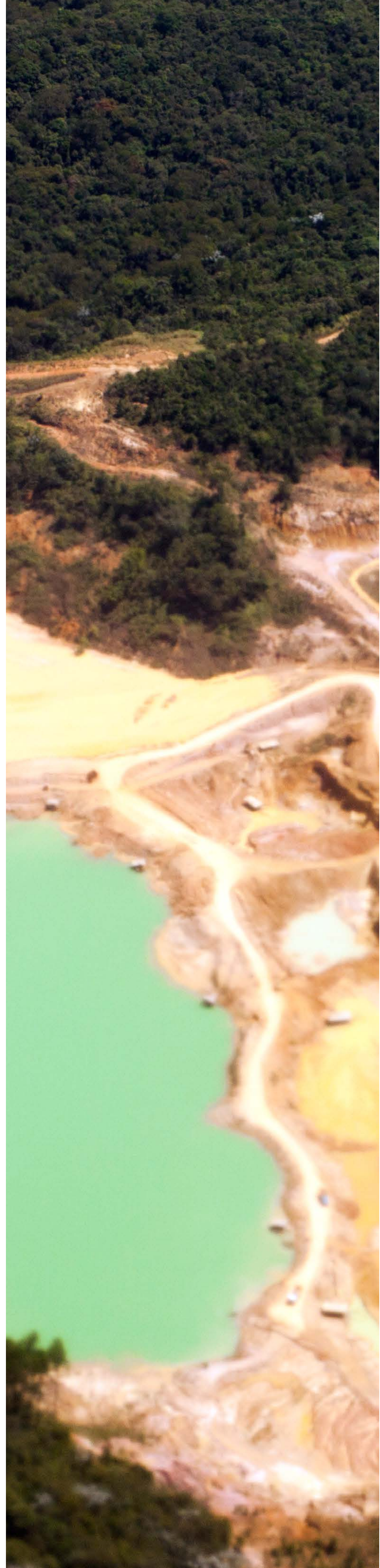
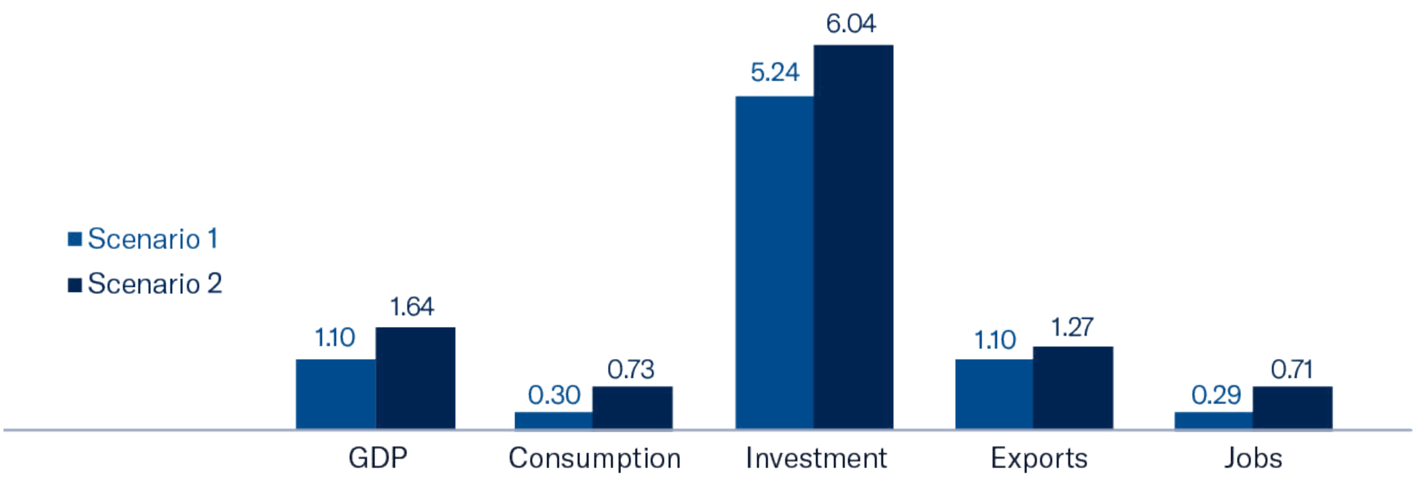


Table 8. Investment and production scenarios for strategic critical minerals: cumulative macroeconomic impact in Brazil, 2026–2050

Macroeconomic Indicators	Scenario 1		Scenario 2		Local Value Chain Development (C2-C1)	
	Variation	BRL$ billion	Variation	BRL$ billion	Variation	BRL$ billion
GDP	1.10%	128.66	1.64%	192.07	0.54%	63.41
Consumption	0.30%	22.35	0.73%	54.63	0.43%	32.27
Investment	5.24%	104.78	6.04%	120.87	0.80%	16.09
Exports	1.10%	23.28	1.27%	26.95	0.17%	3.67
Employment*	0.29%	304,000 jobs	0.71%	750,000 jobs	0.42%	446,000 jobs

Source: U.S. Chamber and AmCham Brazil Analysis | Note: cumulative percentage deviations relative to the baseline scenario.
*Employment is measured in thousands of jobs.



4.2 Regional Results

As expected, the regional impacts under the scenarios are concentrated in the states receiving mineral investments, but value chain deepening (Scenario 2) is an important driver of the regional diffusion of these effects. The results presented in the table below indicate that, under Scenario 1, the regional GDP impacts from 2026 to 2050 are concentrated primarily in the states directly associated with the expansion of mineral production. Pará records the largest cumulative increase, at 16.01%, followed by Bahia (9.85%), Goiás (9.75%), Piauí (3.96%), and Minas Gerais (3.08%). In the remaining regions of the country, the effects are more modest, ranging between 0.01% and 0.10%, reflecting the geographically concentrated nature of this scenario. At the national level, Brazil's GDP increases by 1.10%.

Under Scenario 2, the regional effects become more widespread and, in general, more pronounced as a result of domestic production linkages, the incorporation of minerals into domestic value chains, and the induced effects on employment, income, and consumption. Pará continues to record the largest regional increase, at 16.01%, while Bahia reaches 10.31% and Goiás 9.95%; Minas Gerais rises to 3.83% and Piauí to 3.99%. In addition, states outside the core mineral-producing regions exhibit more significant gains, including Santa Catarina (1.26%), São Paulo (0.72%), and Paraná (0.66%), demonstrating the sectoral and regional spillover effects of value chain deepening. For the country as a whole, cumulative GDP growth reaches 1.64%. The emergence of São Paulo, Santa Catarina, and Paraná as significant beneficiaries under Scenario 2 is particularly relevant: these are Brazil's most industrialized states, with established logistics infrastructure, skilled labor markets, and existing relationships with multinational manufacturers—making them natural locations for downstream processing partnerships.

Finally, the value chain deepening effect, defined as the difference between the two scenarios (i.e., C2 – C1), shows the additional gains resulting from greater domestic value addition. This differential is particularly high in Santa Catarina (1.23%), Minas Gerais (0.75%), São Paulo (0.70%), and Paraná (0.61%), while in Pará the effect is zero (0.00%), indicating that, in that state's economy, the impacts were already fully captured under Scenario 1. For Brazil as a whole, value chain deepening adds 0.54% to GDP.

Table 9. Investment and production scenarios for strategic critical minerals by state: cumulative impact on GDP, 2026–2050

State	Scenario 1	Scenario 2	Value Chain Deepening Effect
Pará	16.0%	16.0%	**0.0%**
Bahia	9.9%	10.3%	**0.5%**
Goiás	9.8%	10.0%	**0.2%**
Piauí	4.0%	4.0%	**0.0%**
Minas Gerais	3.1%	3.8%	**0.8%**
Santa Catarina	0.0%	1.3%	**1.2%**
São Paulo	0.0%	0.7%	**0.7%**
Paraná	0.1%	0.7%	**0.6%**
Rio Grande do Sul	0.0%	0.3%	**0.2%**
Rio de Janeiro	0.1%	0.2%	**0.1%**
The rest of Brazil	0.0%	0.4%	**0.4%**
Brazil	**1.1%**	**1.6%**	**0.5%**

Source: U.S. Chamber and AmCham Brazil Analysis

4.3 Sectorial Results

The sectoral results show that, under Scenario 1, the largest sectoral impacts from 2026 to 2050 are concentrated in the activities most directly associated with the expansion of mineral investment and production. The largest gains are observed in mining and quarrying (4.05%), construction (3.81%), information and communication (0.89%), and professional, scientific, and technical activities (0.71%), in addition to growth of 0.64% in manufacturing. This pattern indicates that, under the first scenario, the effects are concentrated primarily in sectors supplying inputs, infrastructure, technical services, and support for the implementation and operation of mining projects.

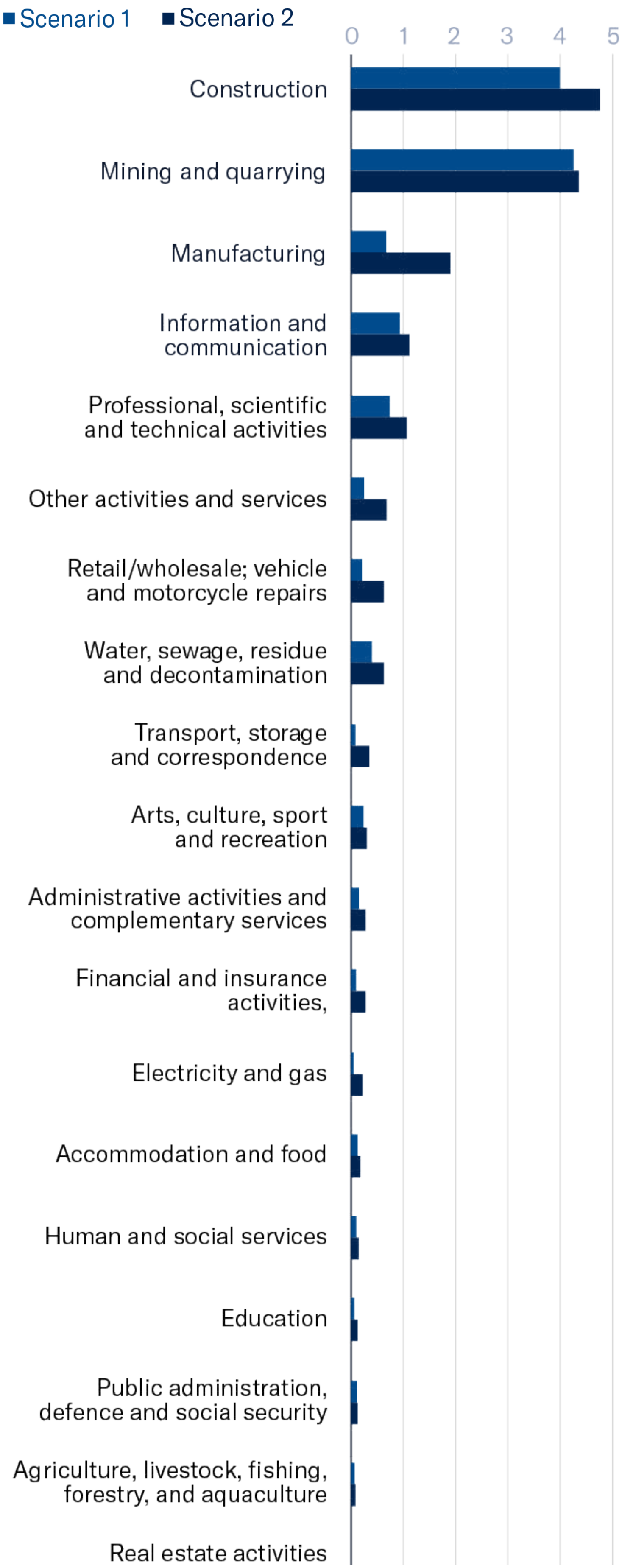
Under Scenario 2, the effects become significantly broader and more pronounced, particularly in manufacturing and sectors associated with domestic value chain linkages. Manufacturing grows by 1.82%, nearly three times the increase observed under Scenario 1, while construction reaches 4.54%, mining and quarrying rises to 4.15%, and sectors such as electricity and gas (0.21%), wholesale and retail trade (0.60%), transportation (0.34%), and other service activities (0.65%) also record more substantial gains. This pattern reinforces that the domestic use of minerals within national value chains broadens the sectoral reach of the impacts beyond the mining sector itself.

Finally, the value chain deepening effect, defined as C2-C1, highlights the additional gains resulting from domestic value addition and processing. The largest differential occurs in manufacturing, with an additional increase of 1.176%, followed by construction (0.729%), other service activities (0.419%), wholesale and retail trade (0.399%), and professional, scientific, and technical activities (0.309%). In contrast, sectors with the smallest value chain deepening effects, such as agriculture (0.002%) and public administration (0.008%), indicate that the additional benefits are concentrated primarily in the industrial and service activities most closely linked to the critical and strategic mineral value chains.

Table 10. Investment and Production Scenarios for Strategic Critical Minerals in the Main Economic Sectors: Cumulative Impact on GDP, 2026–2050

Economic Activity	Scenario 1	Scenario 2	Value Chain Deepening Effect
Construction	3.81%	4.54%	0.7..29%
Mining and quarrying	4.05%	4.15%	0.097%
Manufacturing	0.64%	1.82%	1.176%
Information and communication	0.89%	1.07%	0.18%
Professional, scientific and technical activities	0.71%	1.02%	0.309%
Other service activities	0.24%	0.65%	0.419%
Water, sewage residue and decontamination management activities	0.38%	0.6%	0.22%
Wholesale and retail; repair of motor vehicles and motorcycles	0.2%	0.6%	0.399%
Transport, storage and correspondence	0.08%	0.34%	0.253%
Arts, culture, sport and recreation	0.23%	0.29%	0.059%
Financial and insurance activities, related services	0.09%	0.27%	0.18%
Administrative activities and relates services	0.15%	0.27%	0.125%
Electricity and gas	0.05%	0.21%	0.158%
Accommodation and food services	0.12%	0.17%	0.047%
Human health and social services	0.1%	0.14%	0.043%
Public administration, defense and social security	0.11%	0.12%	0.008%
Education	0.06%	0.12%	0.064%
Agriculture, livestock, forestry, fishing, and aquaculture	0.07%	0.08%	0.002%
Real estate activities	0%	0.03%	0.026%

Chart 2. Investment and Production Scenarios for Strategic Critical Minerals: Cumulative Sectoral Impact, 2026–2050



A more detailed analysis of the impacts on manufacturing industries illustrates the greater potential of the critical and strategic minerals (CSM) sectors under a value chain deepening strategy. The results presented in the table below detail the impacts on manufacturing industries from 2026 to 2050 and show that, under Scenario 1, the largest effects are concentrated in activities directly associated with the supply of machinery, equipment, and industrial goods required for the expansion of mineral production. The most significant gains are observed in mining machinery (9.63%), the manufacture of cleaning products, biofuel manufacturing (2.83%), and the manufacture of trucks and buses (2.17%). Significant increases are also recorded in the manufacture of tractors and other machinery (1.38%), non-ferrous metal metallurgy and metal casting (1.16%), and the manufacture of mechanical machinery and equipment (1.14%), highlighting the importance of demand for capital goods and industrial inputs under the first scenario.

Under Scenario 2, the impacts become substantially stronger and are more concentrated in segments directly linked to the processing and domestic use of critical minerals. The most notable increase occurs in the manufacture of electrical machinery and equipment, which rises to 16.70%, reflecting the expansion of value chains related to batteries, electrical equipment, and energy transition technologies. This is followed by mining machinery (9.77%), automobile manufacturing (5.49%), and the manufacture of mechanical machinery and equipment (2.89%). This pattern demonstrates that, once minerals are used as inputs within the domestic economy, the industrial structure responds more broadly and intensively, particularly in segments associated with electromobility and equipment manufacturing.

Finally, the value chain deepening effect, defined as the difference between the results of Scenario 2 and Scenario 1 (i.e., C2 − C1), highlights the additional gains associated with the domestic integration of these value chains. The largest differentials are observed in the manufacture of electrical machinery and equipment (16.034%), automobile manufacturing (5.116%), and the manufacture of mechanical machinery and equipment (1.742%), followed by the manufacture of household appliances (0.339%), the manufacture of motor vehicle parts and accessories (0.190%), and non-ferrous metal metallurgy and metal casting (0.169%).

Table 11. Investment and Production Scenarios for Strategic Critical Minerals in the Main Manufacturing Subsectors: Cumulative Impact on GDP, 2026–2050

Economic Activity	Scenario 1	Scenario 2	Value Chain Deepening Effect
Electric machinery and equipment	0.67%	16.7%	16.03%
Mining machinery	9.63%	9.77%	0.136%
Automobiles ww	0.37%	5.49%	5.116%
Cleaning, cosmetics and personal hygiene products	3.22%	3.25%	0.024%
Mechanical machinery and equipment	1.14%	2.89%	1.742%
Biofuels	2.83%	2.85%	0.013
Trucks and buses	2.17%	2.28%	0.106%
Tractors and others	1.38%	1.52%	0.137%
Non-ferrous metal metallurgy	1.16%	1.33%	0.169%
Electronic and information equipment	0.56%	0.7%	0.133%
Non-metallic products	0.58%	0.63%	0.055%
Other transport equipment	0.55%	0.61%	0.059%
Car parts and accessories	0.3%	0.49%	0.19%
Household appliances	0.06%	0.4%	0.339%
Furniture and diverse industries	0.24%	0.27%	0.037%
Metal products, except machinery and equipment	0.1%	0.21%	0.102%
Pig iron, ferroalloys, steelmaking, and seamless steel tubes	0.11%	0.19%	0.074%
Rubber and plastic products	0.08%	0.15%	0.078%
Pesticides, disinfectants, paints, and miscellaneous chemical products	0.1%	0.13%	0.024%
Organic and non-organic chemicals	0.09%	0.1%	0.019%
Pharmaceutical chemicals and products	0.02%	0.04%	0.019%

Final Considerations

This study evaluated two economic scenarios for the expansion of critical minerals and rare earth elements in Brazil, encompassing extraction, processing, and downstream industrialization. Scenario 1 assumes production is directed primarily toward raw exports, financed solely by domestic resources. Scenario 2—the deep integration model—envisions a robust share of extracted minerals utilized as inputs for domestic advanced manufacturing, financed through a strategic blend of domestic capital and Foreign Direct Investment (FDI).

The global energy transition is a primary driver of surging demand for copper, graphite, lithium, nickel, and rare earth elements. It also underscores Brazil's strategic position as a mineral powerhouse with substantial reserves and clear comparative advantages. However, as the data demonstrates, transitioning from a predominantly commodity-exporting economy to an integrated hub for advanced technology value chains requires significant capital and industrial vertical integration. Brazil's industrial evolution is not merely a regional policy objective—it is a paramount commercial opportunity. The same market shift that expands Brazil's GDP by an additional BRL $63.4 billion creates the processing capacity, supply chain resilience, and industrial partnerships that U.S. manufacturers and investors actively require.

Current projections verify that Brazil possesses the mineral endowment and the private sector investment pipeline needed to anchor global supply chains for high-capacity batteries, electric vehicles, wind turbines, and electric motors through 2050. To rigorously quantify this potential, the study utilized an interregional, recursive dynamic Computable General Equilibrium (CGE) model. This methodology captures the compounding direct, indirect, and induced economic multiplier effects of mineral development on GDP, household consumption, investment, exports, and job creation.

The results are unequivocal: Scenario 2—which champions value chain deepening driven by international capital—generates vastly superior economic outcomes across all metrics. Leveraging minerals as domestic manufacturing inputs produces a far deeper economic footprint than an export-only model. Specifically, the value chain deepening effect (the differential between the two scenarios) injects an additional 0.54% into Brazil's GDP (BRL $63.41 billion) and generates an additional 446,000 high-quality jobs.

From a regional perspective, value chain integration distributes economic dividends well beyond traditional mining centers, stimulating growth in highly industrialized states such as Santa Catarina, Minas Gerais, São Paulo, and Paraná. Sectorally, the most profound benefits are concentrated in advanced manufacturing—particularly electrical machinery and equipment, automotive production, and heavy mechanics—as well as specialized services and construction. Ultimately, the findings demonstrate that a strategy rooted in downstream industrialization, foreign direct investment, and robust bilateral commercial ties substantially accelerates economic growth and solidifies Brazil's role in the global energy transition. The evidence is quantified, the investment pipeline is identified, the policy framework is maturing, and the strategic reserve base is more than sufficient. The returns on commercial engagement are immense, and the window for early-mover advantage is open.

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Appendix 1

Strategic Hub in the Global Critical Minerals Value Chain

Mineral	Company Responsible	City/Region (State)	IBGE City Code
Graphite	Nacional de Grafite	Itapecerica (MG)	3133501
	Nacional de Grafite	Salto da Divisa (MG)	3157104
	South Star Mining	Itabela (BA)	2914653
	South Star Mining	Guaratinga (BA)	2911808
Lithium	Sigma Lithium	Araçuaí (MG)	3103405
	Sigma Lithium	Itinga (MG)	3134004
	AMG	Nazareno (MG)	3144508
	AMG	São Tiago (MG)	3165008
	Lithium Ionic	Itinga (MG)	3134004
Rare Earth	Serra Verde	Minaçu (GO)	5213087
	Meteoric Resources	Poços de Caldas (MG)	3151800
Niobium	CBMM	Araxá (MG)	3104007
	CMOC Brasil	Catalão (GO)	5205109
Nickel	Vale Base Metals	Ourilândia do Norte (PA)	1505437
	Atlantic Nickel	Itagibá (BA)	2915205
	Brazilian Nickel	Cap. Gervásio Oliveira (PI)	2202455
Copper	Vale S.A.	Carajás (PA)	1502152
	Ero Copper	Jaguarari (BA)	2917706
	Ero Copper	Curaçá (BA)	2909901
	Mineração Vale Verde	Craíbas (AL)	2702355
Iron Ore	Vale S.A.	Canaã dos Carajás (PA)	1502152
	Anglo American	Conceição do Mato Dentro (MG)	3117504
	CSN Mineração	Congonhas (MG)	3118007
	Samarco Mineração S.A.	Mariana (MG)	3140001
Bauxite	MRN e Alcoa	Oriximiná (PA)	1505304
	MRN e Alcoa	Juruti (PA)	1503903

Source: Developed using the results of the CEBRI et al. (2025).

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