Brazil’s Role in the Global Agenda for Critical and Strategic Minerals

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Support

Each country creates its own list of Critical and Strategic Minerals (CSMs)

CM
Critical Minerals

Central to strategic production chains, and subject to supply disruptions due to import dependency, supply interruptions or global scarcity of reserves

- **Supply Risk** – Few countries control most of global production, which might lead to geopolitical or trade vulnerabilities.
- **Low substitutability** – There are often no viable or cost-effective alternatives to replace these minerals.

✗ Brazil has not published a list of CM

SM
Strategic Minerals

Essential for economic development due to significant reserves, production potential, and applications in sectors of technological and commercial importance at the national level.

- **Critical Importance** – Necessary for strategic sectors such as defense, energy, high-tech industries and energy transition.
- **Importance for the economy** – Significant contributors to Brazil's trade surplus

✓ Brazil has a list of SM

- Critical and strategic materials encompass a broad range of substances, with the so-called "transition minerals" constituting a subset within this domain.
- Different countries have their own definition of criticality, which consider supply risks and economic impact. These definitions can change over time.

Source: IBRAM, 2019.

								Other uses
Aluminum	●	●	●	—	○	—	○	Construction, transport, industry, drinks
Cobalt	—	—	—	●	—	—	—	Electronics, steel alloys
Copper	●	●	●	●	●	○	○	Industry, construction, electronics, wiring
Graphite	—	—	—	●	—	—	—	Steel production, lubricants, pencils
Lithium	—	—	—	●	—	—	—	Electronics
Neodymium	—	●	—	●	—	○	—	Industrial magnets, electronics
Nickel	—	○	—	●	●	○	○	Steel Alloys
Palladium and platinum	—	—	—	—	—	—	—	Automotive catalysts
Polysilicon	●	—	—	—	—	—	—	Alloys, lubricants, semiconductors
Silver	●	—	—	—	—	—	—	Jewels, Industry, Investment
Steel	●	●	●	—	●	●	●	Construction, transport, consumption goods
Uranium	—	—	—	—	—	●	—	Defense

Importance of the material for clean energy technology

● High ○ Medium — Little/No demand or not applicable

Energy transition boosts demand

According to the IEA, in net-zero scenarios, **global demand for critical minerals could increase fourfold by 2040**. These materials — including lithium, cobalt, graphite, nickel, and rare earth elements — are key components in batteries, wind turbines, electric vehicles, and other clean energy technologies.

Source: IEA, 2025.

Geopolitical concentration

The current value chain is highly concentrated in a few countries – for instance, **China produces ~70% of rare earths, ~79% of natural graphite, and dominates the refining of several metals**. This concentration has raised global concerns and prompted policies to encourage supplier diversification.

Source: CETEM, 2025; USGS, 2025.

Importance for public policy

Countries like the US (60 critical minerals) and the EU (34 critical raw materials) have **created official lists of critical minerals**, steering investments and regulations.

Brazil, on the other hand, **does not yet have an official list of critical minerals**, which highlights the need to update the national strategy in light of the global context.

Source: USGS, 2022; European Parliament, 2024; MME, 2024.

Brazil in the **Minerals Scenario**

Brazil has a significant geological potential

Brazil holds expressive reserves of several minerals that are strategic for the energy transition.

2nd biggest global reserve of **rare earths**, as well as vast resources of **graphite, lithium, nickel, bauxite, iron ore**, and a near-monopoly of **niobium.**

This endowment puts the country in a privileged position to supply an expanding demand.

Source: IBRAM, 2025.

Giant mineral exporter

Brazilian mining is **overwhelmingly geared towards the export of raw commodities** – in 2021, ~**65% of the value created by the extractive industry was exported**. Brazil is the **2nd largest iron producer** (17.5% of global supply) and leads in niobium (90% of global production), but, in these and other value chains, it still captures only a small share of value added domestically.

Source: SGB, 2024.

Challenges in infrastructure and technology

Despite its geological **endowment**, Brazil faces limitations in turning its mineral wealth into industrial production (**potential**).

Gaps in logistics infrastructure, geological mapping, deindustrialization, destructuring of production chains, and low level of integration between research and industry result in external dependency for higher added value activities, such as refining and manufacturing.

This context underlines the **urgent need for strategic actions** to ensure Brazil can fully take advantage of the window of opportunity for critical minerals.

International benchmarking

Australia and Canada show that mineral resources only lead to development when accompanied by strategic vision and coordinated action.

Topic	Brazil — Takes 17 years to make a reserve productive	Australia — Takes on average 14 years	Canada — Takes on average 20 years
Global Position	Underutilized mineral potencial. Leader in niobium and iron, rising in lithium.	Prominent position in lithium, synthetic graphite, and rare earths. Strong integrated value chains.	Leader in nickel, copper and uranium. Advancing in graphite and rare earths.
Refining and aggregate value	Exports raw inputs, little local refining	Incentivizes industrialization and midstream locally	Develops downstream links (e.g. nickel sulfate, battery materials)
Institutional Environment	Slow licensing, evolving legislation	Predictable environment, integrated mineral policy	Highly stable, strong articulation between national and local levels
Innovation and R&D	Low public investment in R&D and innovation	Royalties reinvested in innovation, mineral technology hubs	Excellence centers in geology and metallurgy, support for applied research
Strategic Incentives	BNDES and incipient sectorial support	Clear critical mineral policies and subsidies for production	Green policies, support of decarbonization and local content
Takeaway	Open window of opportunity – needs to accelerate	Example of integration between resources and industrial policy	Model of legal certainty and innovation geared towards energy transition

Source: S&P, 2025.

Estimated **Demand for Minerals in Brazil**

National energy transition scenario

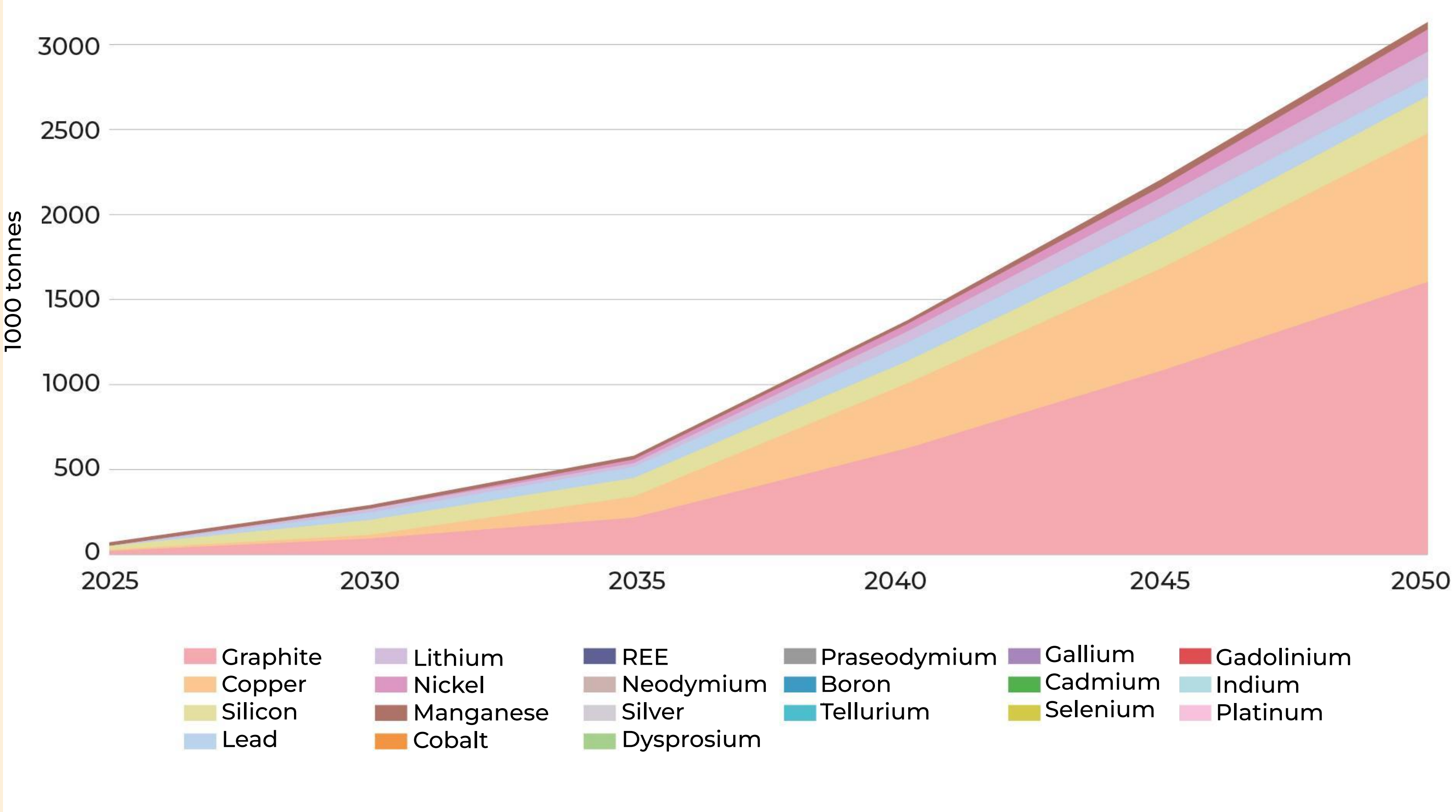
Based on the “Brazil Transition” scenario developed in CEBRI’s Energy Transition Program (GHG emissions neutrality until 2050, aligned with the NDC), a surge in domestic demand for critical minerals is projected.

Low carbon technologies needed for the country’s climate goals – batteries, wind turbine generators, solar panels, electric vehicles, etc. – will increase in scale after 2035, demanding great amounts of critical materials.

Source: CEBRI, 2025.

Growth in demand accelerates after 2035

From 2035, as climate goals intensify, the demand for materials rises rapidly. This translates into expressive increases between 2025 and 2050 (accumulated data).



Material demand accumulated in the period of analysis

Note.: This data refers to net demand — the quantity of material at the required purity level for use in the converter.

To meet this net demand, a much higher amount of raw material must be extracted, considering the inherent losses that occur throughout the various processing stages.

Source: Author's elaboration.

Growth in demand accelerates after 2035

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C Graphite (natural)	**1.600** thousand tonnes (kt)	Essencial anode: batteries already lead global consumption. Largest absolute growth (100% of demand associated to batteries)
Li Lithium	**133** thousand tonnes (kt)	Backbone of electric mobility. Exponential increase until 2040 with vehicle electrification.
Cu Copper	**894** thousand tonnes (kt)	Nerves of the transition: engines and massive electrification 75% related to batteries, grids and electric engines.
Ni Nickel	**117** thousand tonnes (kt)	High performance batteries create a new race for the metal. Strong growth post-2035 (99% for cathodes)

Co Cobalt	**17** thousand tonnes (kt)	Strategic and sensitive input. Stability and traceability are increasingly important. Concentrated use in NMC chemistry (batteries).
REE (Nd, Dy, Pr, Gd)	**12,8** thousand tonnes (kt)	Critical for permanent magnets (essential for generators in wind turbines and electric vehicles). Neodymium dominates demand.
U Uranium	**4,7** thousand tonnes (kt)	Stable and clean complement in a long-term energy matrix. Conclusion of the Angra III nuclear power plant, operating alongside the two existing plants.
Pt Platinum	**0,002** thousand tonnes (kt)	Demand is pressured by the introduction of fuel cell in vehicles and, potentially, electrolysis. Increase in demand can create problems in supply.

Source: Author’s elaboration.

Implications

This scenario points to a materially intensive transition.

Without proper preparation, there is a risk of mismatch between supply and demand, creating bottlenecks in production chains from the mid-2030s onward.

This underlines **the need to plan the expansion of critical minerals supply early**, investing in production, substitutes, efficiency, and recycling in order to avoid bottlenecks.

Potential **Supply of Critical and Strategic Minerals in Brazil**

Concepts

Mineral Endowment	Set of minerals within a given geographical area, whether known or unknown. It represents the total **geological potential**, encompassing both identified resources and undiscovered minerals.
Resource	The known portion of the mineral endowment — the set of minerals whose existence **has been confirmed by geological studies**. It includes both the economically viable portion and the part that cannot yet be exploited.
Reserve	The economically recoverable portion of the resources, whose **extraction is feasible** from both an economic and technological standpoint.
Contained Metal in the Resource	The total quantity, by mass, of the **mineral or element contained within the resource**, without accounting for process losses. In this study, the contained metal includes both resources under production and those still under exploration.

Note: The resource data come from the mineral resources database of the Geological Survey of Brazil (SGB), updated annually. The reserve and production data are sourced from the Brazilian National Mining Agency (ANM) and the United States Geological Survey (USGS). Resource mappings not referenced by the SGB were not considered in this study.

Source: IBRAM, 2024

Current production & content in potential resources

Brazil's minerals resources places it as a potential supplier of several important minerals. However, many resources are underutilized or at early steps of the value chain. Taking advantage of these opportunities requires **expanding production and advancing refining/processing domestically.**

	Production 2024	*Contained Metal*	*Status in Brazil*
Fe Iron ore	**440** million tonnes (Mt)	**21 325** million tonnes (Mt)	Brazil is a major supplier, but exports crude ore with little industrialization.
C Graphite (natural)	**68** thousand tonnes (kt)	**105,3** million tonnes (Mt)	4th largest producer globally. Exports natural graphite, imports higher added value products.
Li Lithium	**10** thousand tonnes (kt)	**740** thousand tonnes (kt)	Production is growing in the Lithium Valley, but no chemical refining in the country.
Cu Copper	**527** thousand tonnes (kt)	**35,7** million tonnes (Mt)	Exports concentrate, imports refined products – negative industrial balance.

	Production 2024	*Contained Metal*	
Ni Nickel	**77** thousand tonnes (kt)	**12** million tonnes (Mt)	Robust established capacity, but focused on ferronickel for stainless steel.
Rare Earths	**0,02** thousand tonnes (kt)	**6,3** million tonnes (Mt)	Brazil has the 2nd largest reserve, but its production is at early stages and it depends on external refineries.
Al Bauxite	**33** million tonnes (Mt) of bauxite **1** million tonnes (Mt) of aluminum	**475** million tonnes (Mt) of aluminum	Competitive national aluminum, but facing high energy costs.
Nb Niobium	**100** thousand tonnes (kt)	**2,2** million tonnes (Mt)	Absolute leader, with >85% of global production. Consolidated mining, but limited domestic use for high-value products.

Source: Author's elaboration.

Challenges and Bottlenecks for minerals production in Brazil

Geological knowledge gap

50% of national territory lacks detailed geological mapping, especially in the Amazon.

This information gap **hinders the discovery of new minerals deposits** and inhibits exploratory investments.

Scarce financing and investment

Mineral exploration involves **high risk and long cycles, requiring robust mechanisms** (funds, BNDES credit lines, fiscal incentives) to boost prospecting.

Stimulating business models through offtake contracts is crucial. International cooperation can accelerate these mechanisms and broaden access to capital.

Industrial infrastructure and capacity

Logistical bottlenecks (transport, energy) **raises costs for projects in remote, minerals-rich regions**.

Limited processing and refining capacity makes Brazil vulnerable considering its dependence on global value chains.

Regulatory and institutional frameworks

Despite recent improvements, investors highlight **regulatory uncertainties and slow licensing** as significant obstacles.

The lack of a clear national strategy until recently also means a lack of prioritization of these chains officially.

Technical and technological capacity

Investments in R&D and professional qualification are needed to build domestic know-how.

Without such measures, the country risks being confined to raw material extraction, forfeiting added value and strategic autonomy.

Strategic Opportunities

Restructuring of global value chains

Consumer countries are seeking to diversify their sources, in order to reduce dependency on dominant suppliers (such as China and Russia).

This creates a unique opportunity for Brazil as a safe and sustainable supplier in global alliances.

Integration in production chains

Beyond minerals exports, Brazil can step up within production chains, producing refined inputs and even components, meeting the demands of the energy transition both domestically and on international markets.

Natural comparative advantage

Holding rich reserves of critical minerals is an asset, especially when combined with clean and abundant electric energy (hydro, renewables) for metallurgical processes.

Strategic materials can be produced with a reduced carbon footprint, an important differential in the current scenario.

Potential for regional development

States such as Minas Gerais and Goiás are already designing specific plans for strategic minerals; others (BA, PA, CE, RN) have identified vocations for graphite, rare earths, lithium, etc. These subnational initiatives, coupled with a national strategy, can lead to growth decentralization and the creation of highly-skilled jobs and new industries in the country.

Latin American cooperation

Alongside neighbouring countries with minerals resources (Chile, Peru, Argentina), Brazil can articulate common environmental and traceability standards, avoiding predatory competition and strengthening the bloc’s position in negotiations.

C
Graphite

Production in 2024	**68 Kt**
Current Reserves	**74 Mt**
Resource	**698 Mt**
Contained metal	**105 Mt**

Total demand until 2050 in the final converter: **1,6 Mt**

Kt: Thousand tons
Mt: Million tons

Brazil as a global player

2nd largest reserve in the world after China and 4th largest producer. In 2024, national production reached 68 thousand tonnes, with the new Santa Cruz mine (BA) beginning operations and planning an expansion. The geological and productive basis already exists – an advantage to attract investments.

Low added value currently

The domestic chain is still focused on exporting raw graphite and importing products of higher value (purified graphite, anodic spheres), generating a trade deficit (~US$ 42 million in 2023). The absence of domestic processing reduces value capture and exposes the country to price volatility.

Frontiers of Opportunity

- Increase purification capacity and the production of battery-level graphite in Brazil.
- Foster R&D involving companies, CETEM, SGB-CPRM, and universities to improve refining and recycling routes.
- Establish treaties with global battery manufacturers to ensure off-take.

Source: Author's elaboration based on data from CETEM, SGB, and Coppe.

Cu

Copper

Production in 2024 527 Kt

Current Reserves 17 Mt

Resource 6.360 Mt

Contained metal 35 Mt

Demand (until 2050) in the final converter: **893 kt**

Kt: Thousand tons
Mt: Million tons

⊕ Nervous system of the transition

Present in solar panels, wind turbines, electrical vehicles, and electric grids, copper is a strategic input both for clean energy and digitalization. Global demand for "green copper" will likely grow with investments in transmission, EV shipments, and general electrification.

⊖ Lack of refining capacity

Brazil has significant reserves and production of copper concentrate (especially in Pará, Goiás, and Bahia), and exports raw concentrates. It imports refined copper (cathodes, wiring) from countries like Chile and China, creating negative trade balances.

Frontiers of Opportunity

- Expansion of domestic refining and casting capacity is essential to reduce commercial deficit and consolidate a national hub of refined copper.
- The development of scientific networks – led by federal institutions and universities – can increase Brazil's competitiveness in processing, recycling, and refining.
- Brazil has the potential to lead, alongside Chile and Peru, a regional sustainable copper agenda, based on converging sustainability standards and transparency in the supply chains.

Source: Author's elaboration based on data from CETEM, SGB, and Coppe.

Li
Lithium

Production in 2024 **10 kt**

Current Reserves **390 kt**

Resource **151 kt**

Contained metal **740 kt**

Demand (until 2050) in the final converter: **133 kt**

Kt: Thousand tons
Mt: Million tons

Lithium Boom

Lithium has become associated with electric vehicle batteries (87% of global use is for batteries). Brazil has historically had a modest production, but recent discoveries of pegmatites (especially in the Lithium Valley in Minas Gerais) boosted the extraction of spodumene concentrate (main mineral in lithium production).

Gap in the chain

Despite the surge in mining, Brazil exports basic lithium and imports high-value products. In 2023, the lithium trade balance had a US$ 60 million deficit - illustrating that the value addition to these inputs is done abroad.

Frontiers of Opportunity

- **Absolute Priority**: transform spodumene concentrate into lithium compost for batteries within Brazil.
- Stimulate R&D in innovative hydrometallurgical routes (less impact) and end-of-life lithium battery recycling.
- Although Minas Gerais leads production, there is potential in the Northeast (CE, RN, PB), in greenfield areas in the south of Tocantins/north of Goiás, and in Itambé (BA).

Source: Author’s elaboration based on data from CETEM, SGB, and Coppe.

Ni

Nickel

Production in 2024	**77 kt**
Current Reserves	**16 Mt**
Resource	**2.020 Mt**
Contained Metal	**12 Mt**

Demand (until 2050) in the final converter:
117 Kt

Kt: Thousand tons
Mt: Million tons

Dual Importance

Nickel is crucial both for traditional industries (64% of use is in stainless steel) and clean technologies, where it integrates high-density batteries (NMC, NCA). Cobalt, a frequent co-product of nickel, is another key metal in cathodes. With the expansion of EVs, demand for high-purity nickel and ethical cobalt are growing rapidly.

Potential to explore

Relevant operations (Vale and others) and ~6% of global reserves, distributed in lateritic (PA, GO, BA) and sulfide (MB, PA) deposits. Production (~3% of the world's) is modest given the potential; Indonesia dominates >60% of current global supply. Cobalt: small known reserves (1 thousand t measured, ~70 thousand t inferred), producing <2% of the global as a subproduct.

Frontiers of Opportunity

- Integrate and aggregate value to nickel production, advancing from basic alloys to class I nickel and sulfate, making use of competitive mines.
- Broaden hydrometallurgical routes for laterites and optimize sulfate flowcharts, integrating cobalt recovery as a co-product and recycling of ion-lithium batteries.
- Structure clusters close to operations – Araguaia, Piauí, Jaguar and Lagoa Grande – with access to integrated logistics and clean and cheap energy, reducing both costs and carbon footprints.

Source: Author's elaboration based on data from CETEM, SGB, and Coppe.

Rare Earths

Production in 2024 — **0,02 kt**

Current Reserves — **21 Mt**

Resource — **3.547 Mt**

Contained Metal — **5,5 Mt**

Demand (until 2050) in the final converter:
12,8 Kt

Kt: Thousand tons
Mt: Million tons

Strategic Importance

The 17 rare earth elements (REEs) are critical inputs for high-performance permanent magnets (neodymium, praseodymium, dysprosium, and terbium especially) used in electric engines and wind turbines, and with applications in electronics, lasers, etc. With ~80% of global production concentrated in China, there is strong geopolitical pressure to diversify suppliers.

Incipient Production

The country has the 2nd largest global reserve of REEs, especially in MG, GO, AM, TO, and SP. However, there is no established processing/refining capacity in the country. Mineração Serra Verde (GO) began mining in 2024 with a goal of 5 thousand t/year of REE concentrate, marking Brazil's premiere in significant primary production.

Frontiers of Opportunity

- Advance beyond mining, establishing processing plants. Serra Verde's operation is a start, but the goal must be to locally produce oxalates and high-level REE metals.
- Invest in the recycling of REEs from electronic residues (out-of-use magnets, batteries, electronics, fluorescent lights).
- Structure regional clusters integrated to the competitive logistical and energy infrastructure.
- Cooperation with other producer countries in South America.

Source: Author's elaboration based on data from CETEM, SGB, and Coppe.

Fe

Iron Ore

Production in 2024	**440 Mt**
Current Reserves	**34.000 Mt**
Resource	**58.916 Mt**
Contained Metal	**21.325 Mt**

Kt: Thousand tons
Mt: Million tons

Global Prominence

Brazil is the second largest producer of iron ore, with estimated production of 437Mt in 2023 and reserves greater than 15 bi tonnes.

The productive structure, lead by Vale S.A., already counts with large scale operations and a commercial surplus of ~US$ 35 b, which reflects the sector's importance in the economy. Exports include products of higher aggregate value such as briquettes, useful for emission reduction in the sector.

Energy transition and a new demand

Steel production is one of the biggest industrial CO_2 emitters in the world. Growing demand for low-carbon steel for turbines, electrical vehicles and green construction creates a new requisite: high-quality iron ore with clean logistics and energy.

Frontiers of Opportunity

- Incentivize domestic production of semi-finished and final products, reducing raw commodity exports and developing the industry.
- Support investments in direct reduction (DR) plants and electric ovens using high-grade ores.
- Promote clean metallurgical routes and steel recycling, integrating the iron ore value chain with the circular economy.
- Position Brazil as a global leader in green iron ore supply, taking advantage of comparative advantages in ore quality and abundance of renewable energy.

Source: Author's elaboration based on data from CETEM, SGB, and Coppe.

Recommendations

Public Policy Recommendations

Immediate coordinated actions are needed. The window is short – competitor countries are moving fast. A strong critical and strategic minerals policy will guide government decisions and provide security to long-term investors.

1. Create a National Strategy
2. Strengthen geological knowledge (PlanGeo)
3. Create a permanent forum for stakeholders to monitor the critical minerals agenda
4. Expedite the ongoing regulatory update
5. Launch R&D and innovation programs focused on transition minerals
6. Create tools to finance and incentivize projects and infrastructure

International Cooperation Recommendations

1

Capitalize on the interest of global powerhouses to diversify critical minerals supply by signing **cooperation agreements**.

2

Use forums like **G20, BRICS, and COPs** to discuss the importance of critical minerals for energy transition and security, and propose collaborative initiatives.

3

Promote Brazilian minerals projects in **international roadshows**, highlighting the advantages: prosperous reserves, stable democratic environment, abundant renewable energy, and government incentives.

Brazil has great untapped potential to meet the new age of demand for critical and strategic minerals, transitioning from mineral exporter to strategic partner in global decarbonization efforts.

- **Abundant Reserves**
- **Growing internal and external demand**

With strategic vision, the country can **transform this context into a historical opportunity** - from commodity supplier to **leader in high-value strategic materials**.

- **Economic Diversification**
- **Development in new mining regions**
- **Generation of high-skilled jobs**
- **Reduction of external vulnerabilities**

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Technical Report:

Brazil's Role in the Global Agenda for Critical and Strategic Minerals

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