

Editorial. Energy transition and extractive dependence: Latin America's dilemmas in the age of critical minerals

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The idea for this dossier effectively gained momentum in the first half of 2025, through discussions held at the Laboratory for Urban-Regional Studies, Landscapes and Territories (LABURP), at the Federal University of Espírito Santo (UFES). It advanced further during the activities of the Meeting of Latin American Geographers (EGAL), held in Mexico in June 2025. At that time, conversations with Professor Luis Jorge Alvarez Lozano, from the National Pedagogical University (UPN), Mexico, broadened the network of collaborators involved in the initiative, as he recommended other researchers from Latin America. Thus, in addition to Brazil and Argentina – countries where we had already established contact with some key scholars working on the topic – we included colleagues from Colombia, Mexico, Panama, and Peru.

At the time, the motivations for organizing this dossier were, above all, to understand the centrality of rare earths to the so-called “energy transition”, given their extensive use, among other applications, in battery production, as well as the extraction of various metals – lithium, copper, manganese, iron, and others – required to ensure the generation and distribution of the so-called “clean energies”. Since then, a series of events has reaffirmed the need to advance this debate, including Donald Trump’s blatant blackmail in continuing to support Ukraine in its conflict with Russia in exchange for its rare earths, as well as China’s response to U.S. tariff measures by blocking the export of several rare earth elements, threatening to strangle that country’s defence industry. More recently, the acquisition of the Brazilian mining company Serra Verde by a U.S.-based company highlighted the disputes surrounding control over these resources, particularly because the company relies on loans from, and equity participation by, the government of its country of origin.

What becomes evident, therefore, is a scenario of global dispute over critical minerals which, as Ana Lía Guerrero points out, has two dimensions: on



the one hand, the deployment of renewable energies and electric mobility and, on the other, their use in the security and defence industries. Investments and trade agreements become geopolitical instruments for controlling these resources and, given the concentration of many rare earth elements in Latin America, the region has been drawn into a “tug-of-war”, placing it in a delicate position vis-à-vis Chinese, European, and U.S. interests. Violeta Núñez Rodríguez, Abdiel Rodríguez Reyes, and Juan Pablo García Farinioni examine these interests in detail in the cases of Mexico and Panama.

The transition from fossil fuels to the economy of critical minerals, as Ana L. Guerrero indicates, marks a new phase of global extractivism, also referred to as energy colonialism or green extractivism, which is materializing voraciously in the Global South, especially in Latin America. The countries of the region are once again being converted into mere providers of natural resources, with little or no processing or value added, as well as providers of raw land-use data extracted by agricultural machinery and drones and subsequently used by digital platforms, as explored by Silvia Gorenstein and Ricardo Ortiz. Forms of permanent primitive accumulation, the primary-export model, and the structural dependency of these countries are thus renewed, whereby mineral resources and cheap labour are supplied while capital and technologies are imported. In this scenario, the United States, and above all, China take charge of the final and higher-value stages of the production circuits of “critical minerals”¹, which may include both rare earths and metals such as copper and lithium. In Latin American, as Jan Lust puts it, cases of neocolonial enclaves abound, where foreign capital exercises almost absolute control over land, minerals, technology, labour power, and other elements.

Across the articles, different strategies and forms of action can be identified. Four of them stand out and are presented in many of the texts included in this dossier. The first is the discursive struggle surrounding the driving ideas – such as “clean” and “green”- that underpin the “corporate energy transition”; the second is the dispute over the State as a field of forces or an arena; the third concerns social struggles and mobilisations; and, related to the latter, the fourth is the challenge of thinking about other forms of social and

¹ According to Ana Lía Guerrero, the term encompasses territories and actors for which natural resources are either not available in adequate quantities or are exposed to significant risks of supply disruption. Two important aspects stand out: first, the condition of being critical or strategic varies according to territories and actors within their respective socio-spatial contexts; second, the term broadens the analytical scope beyond rare earths, incorporating lithium, copper, silicon, and many other minerals.

economic organisation that take into account local solidarities and the right to existence of both human and non-human life.

We begin with critiques of the “corporate energy transition”, which not only imposes a single pathway under the logic of the market, disregarding the multiple energy transitions that are possible within each situated context, but also conceals a range of issues. These include the historical responsibility of the major greenhouse gas emitters and the persistence of these gases in the atmosphere, the environmental and social effects of the initial stages of mineral extraction, and all the pollutants required for the construction of infrastructures for the conversion and transport of so-called clean energies, among others. It is therefore necessary to challenge the commodities consensus by showing that the constructed symbols and meanings – “green”, “clean”, “sustainable”, “energy transition” – serve, above all, to justify the materialisation of a series of objects and actions oriented towards market “transactions”, thereby reproducing a necroeconomy that, in order to produce itself – that is, to live – must kill springs and rivers, flora and fauna, and human beings.

It is also necessary to adopt a position against, with, and despite the State. What can be observed in the articles is the centrality of the State in providing territories with circulation infrastructures, in defining and implementing legal frameworks, in promoting geoeconomics as a geopolitical instrument, among other processes. The examples of mining exploration concessions in Panama, the new mining regulatory framework in Mexico, investments in the railway network and concessions in Brazil, and the legal loopholes in Colombia's Constitution point to several possibilities for contesting, within this arena, both “resources” and development projects. This implies conceiving strategic resources as enablers of a “just energy transition”², in opposition to the single corporate model.

And despite the State, because it is an actor that produces its own vectors while also enabling the vertical vectors of companies whose interest in the territory lies solely in the appropriation of natural resources, regardless of the forms of existence and social reproduction already present there. The strategies of struggle and mobilisation developed by the Mercaderes Community – from raising residents' awareness to monitoring the flows of machinery

2 Following the suggestion of the Grupo de Geopolítica y Bienes Comunes (GYBC), a just transition should be based on an anti-extractivist, anti-capitalist and democratic project, through which the energy crisis becomes an opportunity to transform not only the energy matrix but, above all, civilisation itself.

through the territory – reveal the possibilities of organising territorial uses, meanings and flows in a manner diametrically opposed to the market, placing life and respect for nature first. In Panama, the demonstrations involving different sectors of social movements bring to the fore the primacy of the right to life and health over corporate rights to mineral exploitation in the country.

What emerges from these demonstrations and social organisations, as well as from the analyses and proposals put forward in the texts, is the urgent need to change the development model, aiming first and foremost at reducing consumption and, consequently, the accumulation of wealth. The corporate energy transition, by contrast, points toward unlimited economic growth and a blind faith in techniques and engineering solutions as means of addressing environmental problems. In this sense, the texts in this dossier present both: i) pragmatic pathways, which suggest using strategic resources to obtain technology, financing, higher tax revenues, environmental compensation and even the possibility of building an energy transition compatible with our Latin American reality; and ii) activist pathways, whose proposal is not to depend exclusively on natural resources and to foster new forms of relating to nature, approaching it from a perspective that values ancestry, well-being and life.

In what follows, we briefly outline, *en passant*, the central ideas of each of the eight articles that make up this dossier. The order of the texts seeks, respectively, to address the discourses of energy transition and their effects in Latin America; social mobilisations against mineral extraction and its destructive mode of operation; the circulation of minerals and solar panels between markets of origin and destination; and, finally, the use of digital and information technologies in the countryside.

Ana Lía Guerrero, in the article *Sudamérica frente a las narrativas hegemónicas de los minerales críticos y la Transición Energética Corporativa*, dissects the discursive constructions and power relations that sustain the narrative concerning the importance of critical minerals for the generation of “clean energies” and the existence of a single energy transition, defined as corporate. The adjectives “green” and “clean” conceal an unavoidable reality: the destructive social and environmental effects of the transition towards a low-carbon economy, since investments in infrastructures for the conversion and transfer of new energy sources intensify the extractive metabolism. Latin American countries find themselves at the centre of geopolitical disputes over critical minerals, as well as actions aimed at reissuing the historical dy-

namics of subordinated extractivism, which unevenly distributes sacrifice zones and zones of gain, specialising these countries in the initial stages of extraction and making them dependent on technologies and project financing from external institutions.

Three other contributions deserve particular attention. The first is that, contrary to the discourse of a single corporate energy transition, there would be multiple energy transitions, with different speeds, processes and pathways varying across countries, sectors, and regions. Second, peripheral countries should use their possession of strategic resources as a political tool, with a view to obtaining technology and financial resources for their own development model based on social and environmental justice. Finally, the text offers a distinction between natural, strategic and critical resources. In the specific case of critical resources, it treats them as a situated political and geopolitical construction, generally related to the productive, technological and security needs of each State.

In Violeta Núñez Rodríguez's article *Litio mexicano: desde su "nacionalización" hasta la disputa con China*, the author presents an overview of the global lithium market and its increasingly widespread use in battery production. In this scenario, Mexico, given its significant reserves of this metal, is drawn directly into the conflict between the United States and China over control of the production circuits of rare earths. The background to this dispute is, on the one hand, the arbitration initiated by a Chinese company over lithium exploration rights in response to the more restrictive legislation approved by the Mexican government and, on the other, the revision of the trade agreement with the United States and Canada, in which a specific chapter on critical minerals has been proposed. As the author points out, the new Mining Law, by establishing restrictions on the extraction of lithium and rare earths, as well as social and environmental requirements, will certainly remain under the scrutiny of interests seeking to perpetuate an economic model based on mineral exports and necroeconomics.

The article *El dilema del extractivismo metálico a cielo abierto en Panamá a propósito de "Minera Panamá": entre la sostenibilidad de la vida y la explotación de la naturaleza*, by Abdiel Rodríguez Reyes and Juan Pablo García Farinioni, explores the socio-political crisis generated by the approval of Law 406 in 2023 and its implications for the operating contract of Minera Panamá S.A. In Central America, the open-pit copper deposit – copper being an essential metal for the electrification of transport and energy storage – controlled by

Canadian capital, was authorized to operate without due citizen participation and with a complete lack of transparency. Under the discourse of job creation and tax revenue, a panacea widely used to justify projects of this kind, environmental and social damage was ignored, as was, consequently, the interdependence between the health of all species and that of the environment (One Health)³. Not by chance, as the authors show, this governmental decision unleashed massive social mobilisations led by members of social movements, trade unions and young activists defending the environment and sovereignty. The authors show that, within this diverse group of demonstrators, there were both more pragmatic positions in favour of mineral exploitation, provided that social and environmental interests were safeguarded, and a radical perspective that rejected extractivism and pointed towards a new development model.

In the article *Uso del territorio y explotación minera: movilización y consulta popular en Mercaderes, Cauca (Colombia)*, written by Oscar Esteban Herrera Florez and Márcio Cataia, the power of social mobilisation becomes evident in the construction of horizontal solidarities within the community of Mercaderes, Cauca, Colombia. Pressured by the interests and effects of the actions of gold and oil mining companies, the community mobilised a range of activities in urban areas, peasant organisations and schools, seeking to demonstrate the importance of territory as a source of water and life. This political geography stood in opposition to the country's "national consensus" around the mining-energy locomotive, which treats territories merely as deposits of resources to be appropriated by capital. The struggle for the holding of the popular consultation and its effective realisation, beyond the overwhelming "No" to illegal exploitation, strengthened the community's awareness and role in rethinking and reorganizing its territory, seeking an alternative organisation of flows and uses in opposition to the selfish verticalities of capital, widely supported by the State.

In the article *El puerto de Chancay, la Iniciativa Franja y Ruta, y el desarrollo económico del Perú*, Jan Lust, through the analysis of an investment that mobilised both the Peruvian and international communities, develops several lines of discussion aimed at understanding the deepening of an exclusionary

3 It is a cross-cutting concept that has been discussed across various fields and disciplines, including biology, human medicine, veterinary medicine, ecology and economics, among others. It seeks to broadly integrate human, animal and ecosystem health through a multi- and interdisciplinary approach.

extractivist development model in Peru. This model, dependent on the export of natural resources and on Foreign Direct Investment (FDI) in mining, is the political expression of economic dependence and of the country's insertion into the international division of labour. Internally, this model generates a segmented economy, composed of an advanced economy – controlled by multinational capital and characterised by limited labour absorption – and a subsistence capitalist economy, made up of micro and small enterprises. Externally, the local economy becomes susceptible to mineral commodity prices and to the growth dynamics of importing markets, frequently being pushed into external “shocks”. What stands out is the author's critical stance in showing how China, through a geoeconomics that prioritizes trade agreements and the promotion of FDI, has sought to control the resources necessary for its economic expansion, relegating dominated countries to the initial circuits of resource extraction, in which sectorial linkages are weak and social and environmental impacts are substantial.

The authors Luiz Andrei Gonçalves Pereira, Narcisio Ferreira dos Santos and William Rodrigues Ferreira, in the article *A Geografia do transporte ferroviário de cargas e os fluxos de matérias-primas à base de minerais no Brasil*, analyse the socio-spatial dynamics of freight rail transport of mineral-based raw materials in Brazil. Drawing on a dataset concerning the expansion of the railway network, transported volume, stations, and both origin and destination flows, they highlight the high spatial concentration of the production, transport and destination of mineral-based raw material cargoes. In the authors' view, given the prevalence of the imperial logic of actors that depend on the mineral sector and on the use of railways, investments are channelled towards regions with greater economic profitability, contributing to the concentrated and selective territorial configuration of freight transport in Brazil.

In our view, the article offers three other important contributions. The first is that railway operators or concessionaires – Vale, CSN, MRB, Usiminas, Gerdau, among others – are themselves the main users of this mode of transport for moving their own cargo. Second, it points to the re-edition of a pattern of railway-network organisation that is disconnected from the interests of national territorial integration and passenger transport, insofar as investments aimed at expanding the network seek to serve mining and agribusiness projects, almost always oriented towards the international market. Finally, the State remains a fundamental actor, not only with regard to the rules of the game – the norms – but above all as a guarantor of

investments in network expansion, channelling public funds and assuming the risks of the projects.

In the article *Análise espacial das importações de painéis solares no estado de Minas Gerais (2010-2024)*, written by Gustavo Henrique Gomes Oliveira, Raissa Oliveira Nunes, and Marcos Esdras Leite, the main objective is to understand the dynamics of solar panel import flows into the state of Minas Gerais and the ports of entry for these products between 2010 and 2024. As their findings show, the authors point to a significant increase in solar panel imports from 2017 onward, mainly due to a favourable regulatory framework and to internal factors specific to Minas Gerais, where the combination of average income levels and high energy taxes favoured the expansion of distributed energy generation. Regarding the entry of these panels, the ports of Santos, Salvador and Rio de Janeiro, owing to their logistical capacity, operational efficiency and multimodal integration, concentrate more than 90% of the products destined for Minas Gerais.

The final article, entitled *Agricultura inteligente: nuevos impulsos a la financiarización del negocio agrícola. Algunas notas sobre Argentina y Brasil*, by Silvia Gorenstein and Ricardo Ortiz, explores the characteristics of the diffusion of the biological-digital paradigm, its main actors and its links with financial capital, taking land cultivation in the Southern Cone as its analytical focus. The article highlights not only the dispute over control of agricultural production and commercialization circuits, especially with the entry of the Chinese corporate actor China Oil and Foodstuffs Corporation (COFCO), but also the oligopolistic platformisation that has been taking place through the growing convergence of agrochemical and seed companies, agricultural machinery and equipment firms, and digital technologies. Large corporations have promoted land purchases as well as the financing of startups, or Agritechs, through venture capital, treating land both as an asset to be traded on the stock market and as a source of data. The data are used both to optimize production and circulation and as a possible basis for offsetting carbon dioxide emissions. This new model of production organisation reaffirms the subordinate insertion of countries in the Global South as providers of land and data and as the locus of social problems, such as land concentration, while the Global North retains control over technologies, their development, economic benefits, and related gains.

We hope that the texts in this dossier will contribute, within Geography and related sciences, to advancing the debate on the corporate energy tran-

sition, its social and environmental effects in Latin American countries, and the need to build projects of (re)existence whose *telos* is the valorisation of our ancestral relationship with nature and respect for both human and non-human life. ●