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LETTER TO THE EDITOR

New mining projects threaten southern Brazil's Pampa biome

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Ecosystems located in Rio Grande do Sul state, in the extreme south of Brazil, are threatened by new mining ventures (Brasil de Fato 2020, 2024, Velleda 2024). In addition to the coal extraction that has been taking place in the state for many years (Canofre 2022), other projects are attempting to implement the mining of several new minerals in the south of Brazil (Brasil de Fato 2020, 2024). The Pampa biome covers more than half of Rio Grande do Sul's territory and occurs exclusively in this state within Brazil. The Brazilian Pampa is characterized by grasslands and rich biodiversity, but it is highly sensitive to rapid land-use changes observed in the region (Andrade et al. 2023, MapBiomas 2025).

Mining of rare earth elements (REEs), a set of 17 technologically relevant metals for the energy transition (Depraiter & Goutte 2023), has long attracted the attention of governmental bodies at both state and federal levels, as well as private sector companies (Takehara et al. 2015, Secretaria de Minas e Energia 2018). Nevertheless, this interest has intensified considerably in recent years as a result of rising global demand, particularly from high-tech industries and the renewable energy sector (Pinto et al. 2025). The potential for exploration of REEs is under study in socioenvironmental sensitive regions of the Pampa biome (g1RS 2025b, UFSM 2025). Significant reserves of REEs were also located on the coast of Rio Grande do Sul (g1RS 2025a), raising concerns about the environmental impacts of the exploration of these elements also to the marine ecosystem of southern Brazil (Van Dover et al. 2017).

Beyond the direct impacts on biodiversity, new mining initiatives in the Brazilian Pampa also threaten regions of geological significance. Of note, these mining prospects cover the region of Caçapava do Sul (Brasil de Fato 2020, UFSM 2025), a city with unique geological diversity, being home of Caçapava UNESCO Global Geopark (UNESCO 2023). Notably, this city was affected by a mercury leak in the 1980s associated with mining activities (Brasil de Fato 2020), demonstrating that current mining proposals ignore lessons from past environmental contamination.

We advocate that greater restrictions over mining activities in the state should be applied and expanded to projects involving technologically relevant metals, maintaining consistent environmental standards regardless of the mineral type being extracted. In this sense, as a geological heritage site situated within the Pampa biome, the Caçapava UNESCO Global Geopark must be protected from the influence of any mining project to ensure the conservation of its exceptional geodiversity and fragile grassland ecosystem. The same protective measures should apply to the state's coastal regions, where mining activities pose significant threats to marine biodiversity. Overall, we defend that Rio

Grande do Sul moves away from a development model focused on the exploitation of finite natural resources, adopting an ecologically sustainable development model.

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No new data were created or analyzed in this study.