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The Unfeasibility of Integration Corridors

A Critical Analysis of the Amazon and Rondon Quadrant Routes

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Introduction

The South American Integration Routes (1) constitute a strategic initiative by the Brazilian Government aimed at enhancing regional connectivity, expanding logistical infrastructure, and redefining Brazil's position within global value chains. These corridors are intended to integrate Brazil's productive heartlands—particularly the Central-West and Amazon regions—with Pacific ports, thereby establishing transcontinental connections across South America (Fig. 1). To achieve this, the initiative promotes both the utilization of existing infrastructure and the development of new multimodal transport networks, encompassing highways, railways, and waterways. In doing so, it seeks to shorten logistical distances, reduce transportation and operational costs, and create alternatives to Brazil's historically Atlantic-oriented export routes.

Beyond infrastructure development, the South American Integration Routes carry broader geoeconomic and strategic implications. They are expected to facilitate increased trade with neighboring countries such as Peru, Chile, and Bolivia, thereby strengthening regional economic and political cooperation within South America (2). At the global scale, the routes are likely to consolidate Brazil's role as an exporter of primary commodities, particularly minerals and agricultural goods, while enhancing access to Asian markets—most notably China, Brazil's largest trading partner. At the same time, the corridors could enable greater flows of imported industrial components and consumer products from Asia, underscoring the deepening interdependence between Brazil and Asian economies. By establishing direct overland connections to Pacific ports, the initiative also seeks to reduce reliance on the Panama Canal and limit exposure to potential geopolitical disruptions in maritime trade routes.

The southernmost route, connecting Porto Alegre to Coquimbo, builds upon an already well-established trade corridor for industrial goods between Brazil and Argentina. In contrast, the other routes are not yet significant as effective trade channels and, in several cases, still require substantial investment in infrastructure to become operationally viable. Two routes in the north stand out due to their logistic challenges and potential geopolitical significance:

- Route 2 – Amazon Route, which leverages the hydrographic and road potential of the Amazon region to create direct connections with Andean countries
- Route 3 – Rondon Quadrant Route, designed to integrate production from the Central-West to Peruvian ports via road and rail corridors.

Both routes converge at the Port of Chancay, Peru—a logistics infrastructure recently expanded with Chinese investment—which promises to shorten maritime transit to Asian markets by up to ten days. However, their implementation faces significant challenges that call into question their viability and sustainability of these routes. Contrary to the promises of economic progress, a preliminary analysis of these routes reveals a series of significant economic and environmental obstacles that may render them impractical (3).

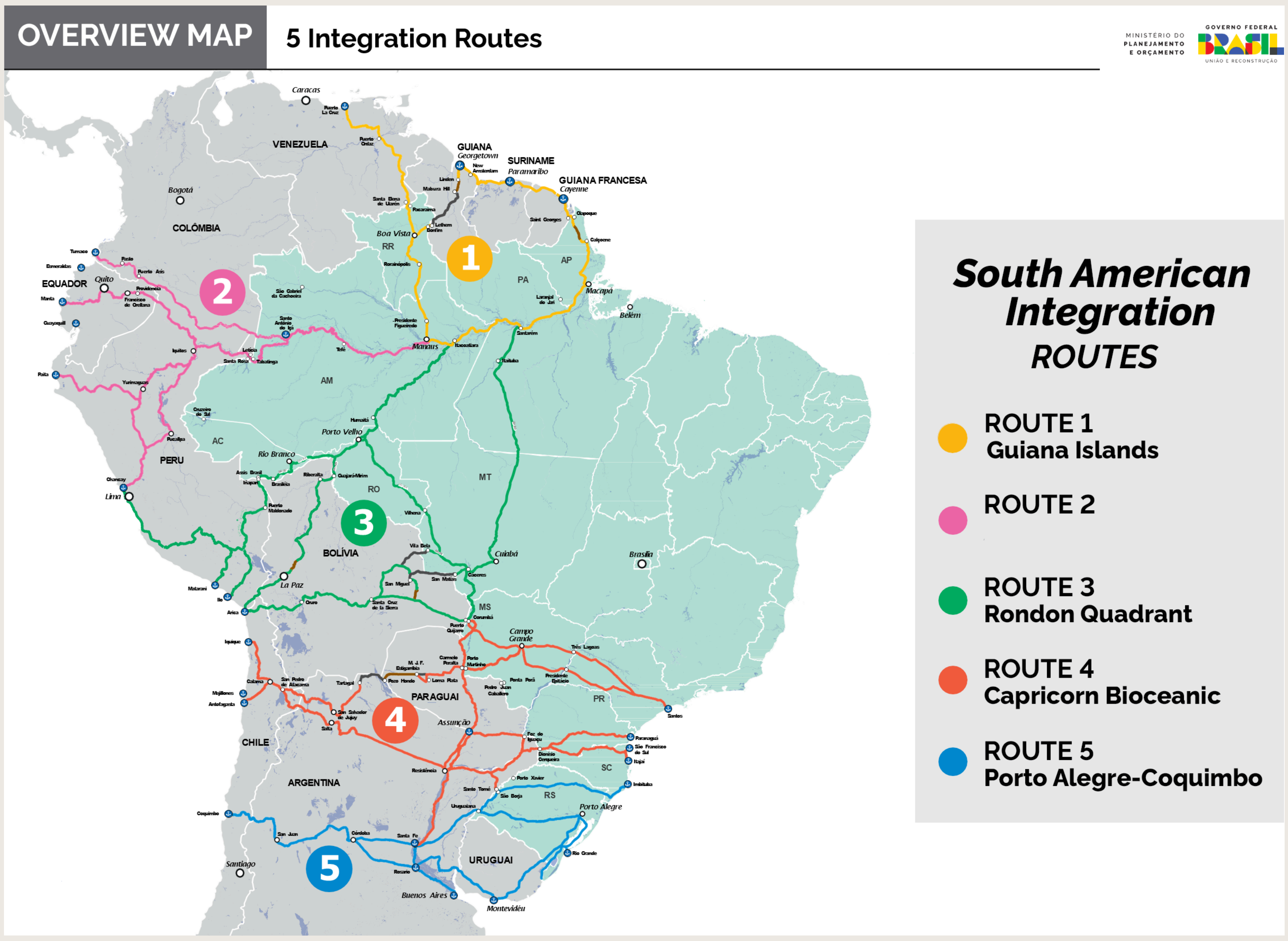

Figure 1 - South American Integration Routes[1]

[1]https://www.gov.br/planejamento/pt-br/assuntos/noticias/2024/novembro/ministerio-do-planejamento-lanca-o-relatorio-2024-do-projeto-rotas-de-integracao-sul-americana/relatorio-2024-do-projeto-rotas-de-integracao-sul-americana

General Context of the South American Integration Routes

The Amazon Route is defined by its multimodal configuration, combining navigable waterways—primarily the Amazon and Solimões Rivers—with highway networks linking northern Brazil to neighboring countries. Its principal objective is to enable Brazilian production to access Pacific ports (4) through shorter and potentially more competitive routes (Fig.1). Although this area currently lacks a significant output of beef and grain commodities, the initiative seeks to stimulate the formation of a new agricultural frontier oriented toward export markets via the Pacific.

The Rondon Quadrant Route, by contrast, is oriented toward the export of agricultural commodities from Brazil's Central-West region, particularly soybeans and corn. Structured primarily around road transport, with prospects for rail integration, the corridor is envisioned to connect the states of Mato Grosso, Rondônia, and Acre to the Port of Chancay on the Pacific coast. This area already ranks among Brazil's main producers of soy, corn, and beef, yet it continues to face substantial logistical constraints due to its landlocked location and strong export dependence.

Currently, most of its production is exported through the Port of Santos, located in southeastern Brazil, via Rumo Logística's Malha Norte and Malha Paulista railway networks. However, exports through the northern ports of Miritituba and Itacoatiara have expanded significantly in recent years, offering shorter routes to international markets. While the Rondon Quadrant Route could benefit from the region's growing transportation demand, it would also confront competition from established export corridors that already provide more consolidated logistical infrastructure and maritime connectivity.

Challenges:

- River seasonality (in the case of Amazon Route): Fluctuating hydrological regimes significantly constrain fluvial navigability, generating logistical vulnerabilities and escalating transshipment costs. Such variability requires the deployment of different vessel types adapted to shallow-water conditions, as well as additional transfers before cargo can undertake the long-distance maritime passage across the Pacific Ocean.
- Current lack of significant demand for export of agricultural products (in the case of Amazon Route): the production of soy, corn and beef in the states of Amazonas and Acre alone would not justify the heavy investments necessary for a new route through the Pacific.
- Safety and operation: The Andean topography, characterized by gradients above 6% and sharp curves, necessitates the use of smaller, lighter vehicles, creating significant operational and safety risks for heavy trucks. These conditions also preclude the use of B-trains which are commonly employed in Brazil for grain transport, thereby limiting efficiency and increasing transportation costs. At present, a similar situation occurs in Brazil on the Rodovia dos Imigrantes, located in the state of São Paulo. Studies conducted by the concessionaire Ecovias, in partnership with the University of São Paulo (USP), revealed that the steep slope of the highway causes drivers to overuse their brakes. This practice can result in overheating and, consequently, complete brake system failure. The highway includes a stretch of approximately 11 kilometers with a 6% gradient, which justifies the implementation of restrictions to prevent accidents and save lives. As a safety measure, heavy vehicles are advised to use an alternative route, the Via Anchieta (SP-150). This restriction is regulated by ARTESP Ordinance No. 11/2002 and is duly explained by the concessionaire Ecovias, with the aim of ensuring the safety of all road users (5).
- Operational costs (both routes): High fuel consumption, vehicle wear, and extended transit times significantly undermine the competitiveness of both corridors. The combination of challenging terrain, inefficient infrastructure, and multimodal transfers further

increases logistical expenses. In addition, regulatory differences between countries—such as requirements for nationally certified drivers or transport companies—can necessitate cargo transshipment at border crossings, adding to delays and operational costs throughout the transport chain.

- Climatic conditions (both routes): Snowfalls, heavy rains, and landslides frequently disrupt logistics flows for extended periods, particularly along high-altitude Andean sections. The insufficient budget for road maintenance and the long distances involved further increase the risk of cargo immobilization during adverse weather events. This problem is particularly critical for perishable agricultural products, which are highly vulnerable to delays and spoilage, adding an additional layer of risk to the operation of these corridors.
- Insufficient infrastructure (both routes): The absence of adequate intermodal facilities, modern cargo terminals, and paved road segments—combined with the presence of steep gradients—significantly constrains corridor efficiency and limits the operation of larger, more efficient freight vehicles. Overcoming these topographical barriers would require investments, with the construction of dry ports, extensive bridges and tunnels in areas where current slopes are unsuitable for heavy trucks. Such infrastructure would entail very high investment costs and could take decades to complete, competing for public resources with other national priorities and with better-established export corridors toward the Atlantic (6).
- Illegal deforestation (both routes): The scientific literature consistently demonstrates that road construction and paving is a major driver of land grabbing and illegal deforestation, posing serious threats to biodiversity and ecosystem services that extend far beyond the immediate vicinity of the highway (7).
- Threats to traditional and Indigenous communities (both routes): The planned corridors traverse or pass in close proximity to traditional and Indigenous territories, heightening the risks of territorial conflicts, resource exploitation, and land dispossession.

Experience from previous infrastructure projects in the Amazon and Andean regions shows that new transport routes often trigger unregulated land occupation, illegal logging, and social tensions, particularly where consultation and compensation mechanisms are weak or absent. These processes threaten not only the local livelihoods and cultural integrity, but also undermine regional governance and social cohesion. These factors suggests that while the Amazon Route promises economic benefits, its environmental and social costs may be unacceptably high, jeopardizing the region's long-term sustainability. Ignoring such impacts disregards Brazil's responsibility to protect a global ecological heritage and the rights of its peoples.

Figure 2 - South American Integration Routes. (Open Route Service)

Final Considerations

The prevailing optimism surrounding the South American Integration Routes—particularly the Amazon Corridor (Route 2) and the Rondon Quadrant Corridor (Route 3)—tends to obscure the substantial technical, economic, and environmental constraints inherent in these projects. The assumption found in the proposal of the Brazilian government that such corridors are technically feasible and economically advantageous are largely unsubstantiated when confronted with even a preliminary analysis of their physical and logistical conditions. These shortcomings highlight the absence of rigorous feasibility assessments and the premature political promotion of large-scale infrastructure investments whose economic returns, environmental impacts, and social consequences remain insufficiently examined.

Furthermore, the expectation that these routes will position Brazil as a key player in trade with Asia is problematic and largely speculative. The Amazon Route, for instance, depends on a multimodal system that is highly vulnerable to seasonal fluctuations in river levels. During the dry season, navigation along major waterways such as the Madeira and Solimões Rivers becomes severely restricted or even impossible, interrupting cargo flows, increasing storage and transshipment costs, and generating significant economic losses. These recurrent disruptions challenge the notion of this corridor as a reliable year-round export route.
The Rondon Quadrant Route, in turn, confronts substantial topographical and technical barriers in crossing the Andes Mountains. The region's steep gradients, sharp curves, and high altitudes impose serious constraints on road transport, limiting the movement of heavy cargo and exposing vehicles to high operational and safety risks (8). Overcoming these obstacles would require major engineering works—bridges, tunnels, and road realignments—entailing long timelines and extremely high investment costs (9). Consequently, the corridor's viability remains uncertain, particularly when compared to more established and cost-

efficient export routes toward the Atlantic. The opening of new roads in the Amazon represents a major risk vector for illegal deforestation and land grabbing, threatening biodiversity and Indigenous territories. Promises of local inclusion often give way to land conflicts and the disruption of traditional cultures, which are frequently disregarded in favor of a development model centered on commodity exports (10).

Before moving forward with any large-scale investment in the South American Integration Routes, there is a need for comprehensive feasibility studies. These studies should employ spatially explicit modeling, integrating detailed topographic and infrastructure data with existing logistics networks and transportation costs to assess not only the technical and economic feasibility of the proposed corridors, but also their socio-environmental impacts. Ex-ante evaluations will reveal operational challenges and cost differentials in relation to established export routes. Analysis of the socio-economic and environmental impacts could draw upon empirical evidence from previous infrastructure projects in the Amazon and Andean regions. Results from transportation modeling together with spatially explicit land-use change simulations can influence policymaking aimed at achieving a better balance between economic benefits and socio-environmental costs. Only through a science-grounded approach can the sustainability and viability of these corridors be credibly assessed.

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