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Brazilian Logistics: Challenges, Advances, and Prospects for National Development

Brazilian Logistics: Challenges, Advances And Perspectives For National Development

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Summary

Brazilian logistics is a fundamental element for national economic competitiveness and plays a strategic role in territorial integration and the consolidation of production chains. This scientific article critically analyzes the main structural, operational, and institutional challenges that compromise Brazilian logistics performance, including the predominance of road transport, the underutilization of more efficient modes, port and rail limitations, the historical investment deficit, and regulatory obstacles. Through an in-depth literature review, the study also examines recent advances related to infrastructure modernization, supply chain digitization, the implementation of new regulatory frameworks, and increased private sector participation. The results indicate that, although there has been significant progress, the country still faces bottlenecks that reduce productivity, increase costs, and diminish international competitiveness. It concludes that overcoming these obstacles depends on an integrated logistics policy, continuous investment, the expansion of multimodality, and the incorporation of emerging technologies capable of transforming logistics into a strategic vector for sustainable development.

Keywords: Logistics, Infrastructure, Transportation, Multimodality, Competitiveness.

Abstract

Brazilian logistics is a fundamental element for national economic competitiveness and plays a strategic role in territorial integration and the consolidation of production chains. This scientific article critically analyzes the main structural, operational, and institutional challenges that compromise Brazilian logistics performance, including the predominance of road transport, the underutilization of more efficient modes, port and rail limitations, the historical investment deficit, and regulatory obstacles. Through an in-depth literature review, the study also examines recent advances related to infrastructure modernization, supply chain digitization, the implementation of new regulatory frameworks, and increased private sector participation. The results indicate that, although there has been significant progress, the country still faces bottlenecks that reduce productivity, increase costs, and decrease international competitiveness. It concludes that overcoming these obstacles depends on an integrated logistics policy, continuous investment, the expansion of multimodality, and the incorporation of emerging technologies capable of transforming logistics into a strategic vector for sustainable development.

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1. INTRODUCTION

Logistics is recognized as one of the essential pillars for economic development, social and productive development of any country. In a territory of continental dimensions, such as Brazil, its importance becomes even more significant when considering the need to integrate regions, reduce transportation costs and ensure the efficient flow of goods for internal supply and for integration into international trade. The topic is therefore strategic for understanding the challenges and the opportunities for national growth.



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Despite the progress seen in recent decades, Brazilian logistics still presents... significant weaknesses. Among the main obstacles, insufficient infrastructure stands out, predominance of road transport, port congestion, poor integration between Modalities and the historical investment deficit. Reports from the National Confederation of Industry (CNI, 2021) and the National Confederation of Transport (CNT, 2022) reiterate that such limitations have an impact directly impacting the productivity, efficiency, and competitiveness of Brazilian companies in the current scenario. global.

In addition to physical challenges, the country faces institutional bottlenecks, such as excessive bureaucracy. Regulatory deficiencies and slow approval processes for large infrastructure projects. These factors They contribute to maintaining a costly, complex, and unpredictable logistics environment. hindering both basic operations and innovation initiatives.

The central problem guiding this study can be summarized in the following question: how does the Brazil's logistics infrastructure conditions national development, and what paths can be taken...

What measures were adopted to modernize and make the country's logistics system more efficient?

The overall objective of this article is to critically analyze the challenges and advancements in logistics. Brazilian, highlighting its economic and structural implications. Specific objectives include investigate the composition and characteristics of the transport matrix, evaluate bottlenecks and limitations of national infrastructure, discuss recent progress and future prospects, and identify opportunities for Modernization and innovation in the sector.

The rationale for the research lies in the relevance of the topic to sustainable development and for the country's competitiveness. The literature shows that countries with efficient logistics systems They offer lower costs, more integrated supply chains, and greater capacity for innovation. and greater attraction of investments. Therefore, understanding Brazilian logistics is fundamental for To propose solutions that promote economic growth and territorial equity.

2. THEORETICAL FRAMEWORK

2.1 Fundamental Concepts of Logistics

Logistics is understood as the process of planning, implementing, and controlling Efficient flow of materials, services, and information from the point of origin to the point of consumption. (BALLOU, 2006). It involves transportation, storage, distribution, inventory management, Order processing and information systems.

Historically, the concept evolved from a limited operational view to a broader approach. strategic, which considers logistics an essential element for value creation and for The competitiveness of organizations. In Brazil, this evolution has accompanied transformations.



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economic, technological, and political changes that occurred from the 1990s onwards, a period marked by Trade liberalization and the expansion of foreign trade.

2.2 The Evolution of Logistics in Brazil

Brazilian logistics development is directly linked to the growth of supply chains. productive and to the increase in exports. With the expansion of agribusiness, especially in the Center- In the West and North, the need to expand and modernize transportation infrastructure has become evident. for the outflow of production.

However, for decades, the country has invested insufficiently in infrastructure. contributing to the formation of bottlenecks that still persist. The CNT (2022) points out that more than 60% of highways are considered to be in fair, poor, or very poor condition. Furthermore, the rail transport system was... Neglected, with slow expansion and a lack of integration between regional networks.

Despite this, the sector has recorded significant progress in recent years, driven by railway and highway concessions, new port regulatory frameworks, adoption of technologies logistics, private investments focused on exports, and incentive policies for multimodality.

2.3 Brazilian Transportation Matrix

Brazil's transportation matrix is characterized by a strong concentration on road transport. responsible for approximately 60% to 65% of cargo movement (FREITAS, 2021). Although flexible, this mode of transport is expensive, polluting, and vulnerable to accidents, cargo theft, and variations. climate.

Unbalanced distribution compromises logistical performance and hinders the adoption of Intermodal and multimodal operations are fundamental for reducing costs and emissions.

2.4 Infrastructure, Competitiveness and Economic Development

The literature unanimously affirms that adequate infrastructure contributes to a reduction in costs, increased productivity and greater territorial integration. Porter (1990) highlights that logistics Efficiency is one of the determining factors of a country's competitive advantage.

In the Brazilian case, studies show that the logistics deficit reduces GDP and delays the flow of goods. production costs increase, making prices more expensive for consumers. The CNI (2021) estimates that Brazil loses approximately 20% of its competitiveness is lost due to logistical failures.

3. METHODOLOGY

The research is characterized as a qualitative study, of an exploratory and descriptive nature.



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Based on a literature review and document analysis. Sources consulted included books, scientific articles, institutional reports, government documents and publications from entities sectorial bodies (ANTT, ANTAQ, CNI, CNT, Ministry of Infrastructure).

The time frame covers works and studies published between 2000 and 2023, allowing To identify recent advances, emerging trends, and persistent challenges. The method adopted follows An interpretative approach, relating the data to existing theory on logistics and competitiveness.

4. RESULTS AND DISCUSSION

4.1 Dependence on Road Transport

The predominance of road transport in the Brazilian logistics matrix is one of the elements structural factors that most negatively impact the efficiency of the transportation system. Although this The mode of transport offers great reach and operational flexibility, which favors the distribution of The movement of goods between urban centers and peripheral regions, and their excessive use, reveals a Historical dependence that compromises national logistics costs. For short and medium distances, the Road transport is functional; however, for long distances, such as in export flows...

For agribusiness, it becomes costly, slow, and vulnerable to disruptions.

Brazil primarily uses highways to transport agricultural production from the Midwest. all the way to the ports of the Southeast and South, crossing thousands of kilometers with infrastructure. often inadequate. Studies by CNT (2022) show that more than 60% of highways The vehicles evaluated exhibit some type of structural deficiency, ranging from potholes to lack of signage. Drainage and shoulder issues. These conditions result in higher fuel consumption and wear and tear. Premature vehicle replacement, increased accidents, and loss of productivity, raising the so-called Cost Brazil.

Another factor that exacerbates the problem is the low rate of paved roads: only about 12%. Brazilian roads have adequate paving, compared to rates exceeding 70% in other countries. like the United States and Canada. This disparity reveals the urgent need for investment. Robust public and private initiatives are needed to adapt the road transport system to current demands.

In addition to this, there are further logistical challenges, such as the risk of cargo theft. Congestion, environmental limitations, and dependence on fossil fuels. Vulnerability. Climate also influences the performance of the mode of transport, since heavy rains or severe droughts can... severely compromise traffic on highways not prepared for extreme weather conditions.

Thus, excessive reliance on road transport, coupled with a lack of continuous maintenance, This represents a structural bottleneck that compromises national competitiveness and reinforces the need diversification of the transport matrix.



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4.2 Railways: Slow but Necessary Expansion

Rail transport is recognized as one of the most efficient alternatives for transportation.

for large volumes and long distances, especially for heavy loads such as ore, grains and

Despite this, Brazil still has an insufficient and poorly maintained rail network.

Regional integration, a legacy of decades of limited investment and disjointed planning.

In recent decades, there have been significant advances, such as the expansion of the North-South Railway,

considered a structuring axis of national integration; the development of the Integration Railway.

The West-East Railway (FIOL), important for the flow of grains and ores; and the expansion of the rail network.

Paulista, which receives a large portion of private investment in railways. Furthermore, the New Framework

The Railway Law (Law No. 14.273/2021) introduced the railway authorization regime, expanding

Private sector participation and accelerating the implementation of new sections.

However, significant challenges remain. The lack of standardization and integration between different

The network hinders multimodality and limits the potential for economies of scale of the mode.

predominance of specific loads — especially iron ore, responsible for a large part of the

Rail traffic — reduces operational diversity and exposes the sector to risks of dependency.

economic.

Another relevant point is the difficulty of connecting railways to ports and industrial centers.

In many cases, the railway ends in locations without efficient intermodal connections, forcing

Operators are using trucks to complete the journey, which negates some of the logistical gains.

expected.

Nevertheless, experts believe that the future of Brazilian logistics depends heavily on it.

from railway expansion, which can reduce costs, CO₂ emissions and pressure on highways. A

Recent developments indicate that the country is on the right track, but the pace is still slow compared to the urgency.

of contemporary logistical challenges.

4.3 Waterways: Underutilized Potential

Despite having over 40,000 km of navigable rivers, Brazil only utilizes about...

13,000 km for commercial transport, highlighting an immense logistical potential that remains.

Underutilized. Waterways represent one of the most economical and environmentally friendly modes of transport.

Sustainable, but geographical and institutional factors limit its expansion.

Among the main obstacles are the lack of continuous dredging and the absence of signage.

adequate in some sections, poor logistical integration with dry ports and multimodal terminals and

Environmental difficulties related to licensing. The Madeira River waterway, for example, is...

Strategic for agribusiness, but suffers from variations in water levels and a lack of infrastructure.

support. The Tietê-Paraná waterway, however, faces recurring interruptions due to droughts and problems.



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water management.

From an economic standpoint, the full utilization of waterways could reduce significantly increase transportation costs, especially for large volume and low value cargo. aggregate. Countries like the United States and China make extensive use of their waterways as part of essential to their logistics networks. In Brazil, however, the absence of public policies Consistent and coordinated investments prevent the full development of the transport sector.

The expansion of waterways requires inter-institutional planning, federal coordination, and... Continuous investments represent one of the great opportunities for improving Brazilian logistics. for the coming decades.

4.4 Ports and Export Logistics

The Brazilian port system is fundamental to foreign trade, since more than 95% of the country's exports are carried out by sea. Despite their importance, the ports national countries face historical bottlenecks related to bureaucracy, insufficient infrastructure, and low... operational efficiency.

Customs bureaucracy is cited as one of the main causes of delays in operations. port operations. Slow processes, excessive paperwork, and poorly integrated systems result in longer waiting times for cargo release. ANTAQ (2022) indicates that logistics costs Port costs can represent up to 30% of the total export cost, a value considered high in Comparison with international standards.

Another recurring problem is the limited port-rail integration, which forces a large part of the Cargo arriving at ports by truck generates congestion and increases delivery times. Waiting and pollution. Kilometer-long lines of trucks are common at grain export terminals. especially during harvest periods.

Despite the challenges, Brazilian ports have made progress through concessions. Expansion of private terminals (TUPs) and investments in port technology. The Port of Santos, For example, it implemented digital scheduling systems that reduced queues and improved... Operational management. However, modernization is still occurring unevenly across different regions.

of the country.

The consolidation of an efficient port system is essential for Brazil to achieve... global competitiveness, especially in a scenario of increasing international demand for agricultural and mineral commodities.

4.5 Technological Innovation and Digitalization

The incorporation of emerging technologies into Brazilian logistics represents one of the advances.



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One of the most promising ways to increase efficiency is through the digitalization of the supply chain.

driven by solutions such as the Internet of Things (IoT), blockchain, artificial intelligence,

Real-time tracking systems and integrated logistics management platforms.

These technologies allow for greater visibility into operational flows, route optimization,

Reducing losses, improving fleet monitoring, and increasing operational safety. In the sector

In the port sector, digital management systems are already reducing inspection and document processing times.

On highways, smart sensors and telemetry assist in vehicle control and diagnostics.

preventive.

However, technological adoption is uneven. Large logistics operators and companies

Multinational companies are rapidly advancing in digitalization, while small and medium-sized enterprises...

They face barriers related to costs, lack of training, and limited technological infrastructure.

This scenario creates asymmetries that hinder the full integration of the logistics chain.

Furthermore, technological advancement demands modern regulatory frameworks and interoperability.

between public and private systems, and policies to encourage innovation. Only with an ecosystem

Integrated, emerging technologies can fully contribute to reducing the "Brazil Cost" and

To raise the bar for national logistics efficiency.

5. FINAL CONSIDERATIONS

Based on the analysis carried out, it is evident that Brazilian logistics faces a set of...

complex, interdependent, and historically constructed challenges that limit competitiveness and

The country's capacity for economic integration. The predominance of road transport, associated with low

The quality of the existing network represents one of the main structural obstacles, causing high...

operational costs and reduced efficiency in the flow of production. Added to this is the use

limited railway and waterway infrastructure, modes of transport that, despite their great potential for long distances

and bulky cargo, remain underexploited due to lack of investment, problems

Regulatory issues and lack of intermodal integration.

Port performance, although it has shown significant progress in the last decade,

It still needs further modernization, a reduction in bureaucracy, and an expansion of access infrastructure.

Land transport. The low synergy between ports, highways, and railways compromises logistical fluidity and makes it difficult.

The consolidation of more competitive production chains on the international stage. Similarly,

Fragmented governance, lack of long-term strategic planning, and instability.

Regulatory issues harm the investment environment and delay essential infrastructure projects.

national.

However, research shows that the country has the conditions to reverse this scenario and

To move towards a more efficient and sustainable logistics system. The results analyzed indicate



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that the modernization of Brazilian logistics requires a coordinated set of structural actions and institutional initiatives, among which continuous, planned, and sustainable investments stand out. Modal integration and diversification, strengthening public-private partnerships, planning Integrated strategy. Only by combining these efforts will it be possible to build a Modern logistics that is resilient and aligned with contemporary productivity challenges. Sustainability and global competitiveness.

It is concluded that logistics transformation should be understood not only as a operational necessity, but as a national development strategy, capable of To boost the economy, reduce regional inequalities, and position Brazil more robustly. in the international market.

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