

Bibliographic Review of Road Transport Dependency in Brazil

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ABSTRACT

With the recent truckers' strikes, the current dependence of Brazil on the road transport mode has become apparent. Each strike results in a lack of supplies in various regions of the country, causing a crisis that worsens with each day of standstill. Furthermore, the road transport mode faces challenges such as inadequate road infrastructure, high fleet maintenance costs, infrequent updates to freight rates, and even fuel expenses. The applied methodology is deemed sufficient for a qualitative approach, supported by a bibliographic research analysis grounded in records from institutional websites addressing the same thematic, as well as books, scientific articles, and monographs. These sources were instrumental in acquiring the knowledge incorporated in this work. The overarching objective of this investigation is to explore the dependence on the road transport mode in Brazil. In the context where road transport companies incur significant costs in maintaining their fleets operational, the research reveals that the road transport mode is adversely affected by the deterioration of highways. The prospect of altering this situation has been invigorated by the launch of the new PAC (Growth Acceleration Program), indicating a substantial investment of R\$ 1.7 trillion Brazilian Reais.

Keywords: *Dependence; Modal; Road Transport; Transportation; Cost.*

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I. INTRODUCTION

The research focus of this scientific article is to examine the dependency that Brazil has on road transport. The phrase that became the motto of President Washington Luís's government in the early twentieth century was: "To govern is to open roads [1]." Perhaps the main intention of that government would be to open roads and not to be dependent on them, but from 1950 onwards, when automotive industries became central in public policies, the need for road transport in Brazil grew alarmingly.

Currently, road transport accounts for 75% of inter-regional freight transportation in the country, according to data from a Logistics Costs in Brazil survey released by the Dom Cabral Foundation in 2023. There are over 1.8 million kilometers of roads built, with 146 thousand kilometers of them being paved and the responsibility of the government [1], [2], [3].

With high logistics costs, road transport in Brazil is currently the highest, besides fuel costs, which are another component of this cost, companies also have other expenses such as vehicle maintenance and cargo insurance.

The decision to research the topic in this article was driven by the interest in analyzing the current dependency of the country due to road transport. Currently, the flow of the National GDP is heavily concentrated in the hands of truck drivers, who in turn have high maintenance costs for their fleet [2].

The applied methodology suffices for a qualitative approach supported by a bibliographic research analysis based on records from websites of institutions researching the same theme discussed here, books, scientific articles, and monographs, to attain the knowledge contained in these sources during the elaboration of this work.

The general objective of this investigation is to study the dependency of road transport in Brazil. The specific objectives are as follows: To comment on the different types of transport modes occurring in Brazil; to discuss the evolution of transport logistics.

This scientific article is organized into four sections. The first was the introduction in which the objectives of this research were explained. The second section was dedicated to theoretical foundation where various discussions and consultations of opinions from authors and institutions that researched the same topic were conducted. The third section presented the methodology adopted for the development of this study and, finally, in the fourth section, the final considerations of this article were elaborated.

II. MATERIAL AND METHODS

The applied methodology is deemed sufficient for a qualitative approach, supported by a bibliographic research analysis based on records from websites of institutions researching the same theme discussed here, books, scientific articles, theses, to attain the knowledge contained in these sources during the elaboration of this work.

According to González (2020, p. 02),

Qualitative Research refers to a wide range of perspectives, modalities, approaches, methodologies, designs, and techniques used in the planning, conducting, and evaluation of studies, inquiries, or investigations interested in describing, interpreting, understanding, or overcoming social or educational situations considered problematic by the social actors who are its protagonists or who, for some reason, have an interest in addressing such situations in an investigative sense [4].

The main authors who contributed to the elaboration of this study were: Mesquita (2018), Laurindo (2019), and Souza (2022). It is also considered important to cite the institutions that collaborated with this research: CNT (AGÊNCIA BRASIL, 2023), Dom Cabral Foundation (ESTADÃO, 2021; CLICKLOGTRANSPORTES, 2023), and ABAC (2024).

III. THEORETICAL FRAMEWORK

3.1 Transportation Modes in Brazil

Currently, the transportation matrix in Brazil is in imbalance because the majority of products are transported by road transport. Given its vast territorial expanse, Brazil could explore other modes such as railways, which are open to all types of cargo.

The majority of Brazil's territory is concentrated in highways for passenger and freight transport. According to the Logistics Costs in Brazil research by the Dom Cabral Foundation, 75% of the country's production is transported via road networks, followed by maritime (9.2%), air (5.8%), rail (5.4%), coastal shipping (3%), and inland waterway (0.7%) transportation modes [1], [3], [5].

Graph 1 below presents a comparison/projection indicated by the National Logistics Plan (PNL) regarding the advancement of transportation modes in Brazil. The percentages provided refer to the diversified usage of each mode and not to their respective transport capacities.

Graph 1 – National Logistics Plan (PNL) 2017 – 2035



Source: [6]

In this graph, a significant evolution of the railway mode is observed, contrasting with a significant reduction in the road mode and the limited evolution of the coastal shipping mode. Currently, due to the excessive dependence on road transport for the flow of goods, the country faces collapse during truckers' strikes, leading to nationwide shortages in all sectors, according to transportation experts cited by the British Broadcasting Corporation (BBC). Each truckers' strike has its grounds, whether due to road infrastructure, high fleet maintenance costs, diesel price hikes, freight rate adjustments, or even security concerns [3], [7].

Regarding the overall condition of highways (infrastructure), a survey conducted by CNT in 2023 analyzed 111,502 kilometers of paved highways, including 67,659 kilometers of federal highways (BRs) and 43,843 kilometers of major state routes [8]. The study considered three main characteristics of the road network: pavement quality, signage, and road geometry, to classify highways based on their overall condition. It also assessed pavement conditions, signs, shoulders, curves, and bridges [8]. In 2023, the percentages for Regular, Poor, and Very Poor conditions for these characteristics were 56.8% for pavement, 63.4% for signage, and 66.0% for road geometry, respectively. These percentages were similar to those recorded in the previous year, which were 55.5%, 60.7%, and 63.9%, respectively [8].

The poor quality of road pavement not only affects ideal traffic conditions but also impacts freight rates and the availability of products to end consumers. Inadequate roads lead to increased fossil fuel consumption and gas emissions, which are measured as part of sustainability efforts, using diesel waste as a metric [8]. According to the pavement quality assessment results (56.8% Regular, Poor, and Very Poor; and 43.2% Excellent or Good), it is estimated that unnecessary consumption of 1.139 billion liters of diesel will occur in the country's road transport system this year. The burning of this amount of fossil fuel will result in the emission of 3.01 million tons of pollutant gases (MtCO₂) [8].

In Brazil, there has never been a prioritization of adopting different transportation plans by Brazilian authorities. This is because such measures lack electoral appeal. A prime example is the North-South railway project, which aimed to connect the country but never materialized. The tendency to prioritize highways due to political and economic interests has resulted in over-reliance on road transport. One solution is to increase investments in infrastructure projects that were initiated in the past, such as railway construction projects that were abandoned before completion. Thus, the current state of the railway mode can be summarized as having limited available railways, and the existing ones do not establish sufficient connections, thus limiting the use of the railway mode [3], [7].

Road transport in Brazil is a public and private service that is currently essential, involving buses, trucks, trailers, semi-trailers, small vehicles, and even motorcycles. It is the primary mode of transportation for both goods and passengers across the national territory [9]. The Dom Cabral Foundation shows that road transport in Brazil can account for up to 75% of the total transport matrix. Only 9.4% of these goods are transported by maritime transport, 5.8% by air transport, 5.4% by rail, 3% by coastal shipping, and only 0.7% by inland waterway transport [1], [3], [10].

With constant threats of truckers' strikes, the country needs to evaluate its other modes of transportation. Forgotten railways can reduce transportation time and increase cargo volume, significantly reducing maintenance costs. Investing in railways is a long-term investment with noticeable benefits, including improved road traffic, reduced emissions, decreased accidents, and lower cargo theft rates, which contribute to the high cost of cargo insurance.

Coastal shipping offers many advantages, including delivery of various goods with predictable schedules, lower risk of damages and theft, reducing accidents by 10,000/year, and consequently lowering insurance costs. In 2021, there were only 13 thefts out of 455 thousand operations, totaling 0.04 thefts per 1,000 operations and 20 occurrences. The environmental sustainability of coastal shipping, emitting 4 times less CO₂ compared to other transportation modes and causing fewer environmental accidents, adds to its appeal [11].

According to Souza (2022, p. 11),

despite low activity levels, coastal shipping in Brazil is considered a promising option for the coming years, with an average increase rate of over 10% in containerized cargo over the last decade. Comparing January to October 2020 with the same period in 2019, coastal shipping has already increased by more than 14% [11].

Intermodal door-to-door transportation offers convenience to customers by moving goods safely and efficiently, with efficient logistics planning ensuring cargo security and punctual delivery. With punctual delivery rates of 90% over the past 3 years, transporting fractional loads is implemented with customized solutions according to each client's needs, ensuring efficiency and security throughout the transportation process.

In addition to the convenience offered by intermodal transportation, coastal shipping presents competitive costs in the market, especially for long and short distances where large volumes of cargo are transported due to its efficiency and guarantees of low accident risks, making transportation safer and reducing road maintenance costs in the country. Currently, road transport in Brazil represents 65% of dependency with deficiencies, even considering that for distances over 800 km, alternative modes to road transport are more appropriate due to their low cargo capacity. Nevertheless, road transport remains the primary link in the supply chain in the country [12].

3.2 The Logistics Evolution of Transportation

Discussing the logistics evolution of transportation in Brazil is fascinating for those who experienced this intense and innovative period, particularly in the 1990s, following the implementation of the Real Plan, which opened up markets and saw the expansion of new logistics companies with international experience [13].

The consolidation of road transport as the preferred transportation system was determined by its implementation cost per kilometer and its gradual capacity expansion capabilities, meeting demand as it arises. Institutional mechanisms such as the creation of the National Road Fund (FRN) set the pace for rapid growth in Brazil's road infrastructure [14].

Brazil experienced a period of significant industrial growth from the post-World War II era until 1980, followed by the expansion of road infrastructure and the dominance of truck freight transportation [14].

Paulo Resende asserts that Brazil exhibits what he calls the subjective factor, related to the business management model. Politicians and bureaucrats believe: "I have to leave the mark of my government and do something new." Everyone entering the government abandons previous projects and establishes new ones according to their preferences. The plan is to replace the old with the new and completely abandon the old. This creates discontinuity between projects. Working on short-term goals is a cultural issue because it is related to the electoral agenda [5].

Soon after, industries began to face a consumer market full of demands and more flexible methods to standardize products according to customer orders. At that time, all known technological development was concentrated on production lines, with less focus on end customer service. Transportation began to see significant movement of goods, and carriers offering reduced prices became highly sought after for such cargo movements.

However, the quality of transportation and deliveries was not as high, but the market did not prioritize it, as they sought transportation where goods were delivered from one point to another as quickly as possible [13].

The central objective of logistics is to achieve a level of customer service at the lowest possible total cost, seeking to offer alternative logistics capabilities with an emphasis on flexibility, agility, operational control, and a commitment to achieving performance with quality [15].

Sérgio Ejzenberg, a traffic consultant with a master's degree in transportation from USP, states that Brazil finds itself in this almost total dependence on road infrastructure as a result of years of "disastrous" decisions, and there is no quick way to change this situation [5], [7].

Therefore, Brazil continues to depend on the road mode for the reasons already mentioned and for these: the lower cost, the only mode that transports goods from point to point, the fastest alternative, route flexibility, quick release, and cargo diversity [1].

Over time, logistics became necessary in Brazil's business daily life. Before the 1950s, rail freight transportation was one of the main ways to transport goods across the country, but with the military government, these railways were neglected or handed over to private initiatives. The challenges faced today, post-COVID-19 pandemic, have led many companies to review their processes and make behavioral changes towards the consumer market, which now prefers to shop online, from the comfort of their homes, expecting fast, efficient, and high-quality product delivery. A post-pandemic world with online shopping has become a "new normal" for the technological and logistical evolution that we have acquired without even realizing it [16].

IV. DISCUSSION AND CONCLUSION

The present study aimed to analyze data based on triangulations from various logistical sources describing observed facts in bibliographies raised according to the authors' analyses, focusing on the quantitative aspects of logistical costs across modalities and subsequently addressing a critical analysis of the road modal.

This research has revealed the extent of Brazil's dependency on the road modality, whether in public or private service, despite limited government investments in the country's roads and highways. Consequently, it is considered that the country could invest more in roads or even in the railways scattered throughout the country, awaiting their respective completions; and, in some cases, in railways already completed but dilapidated over time.

In this scenario, where road modal companies face high costs in maintaining their fleets in operation, the research has found that the road modality suffers from the wear and tear of highways. The hope of changing this situation gained momentum when the current Federal Government launched the new PAC (GAC - Growth Acceleration Program), signaling an investment of R\$ 1.7 trillion [17].

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