

**Socioeconomic impacts with the implementation of the railroad EF-118 RJ/ES:
comparison of cargo logistics at the Port of Açú**
**Impactos socioeconômicos com a implantação da ferrovia EF-118 RJ/ES: comparativo
de logística de carga do Porto do Açú**
**Impactos socioeconómicos con la implementación del ferrocarril EF-118 RJ/ES:
comparación de la logística de carga en Puerto del Açú**

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Abstract

Since the beginning of operations in 2014, Port of Açú has shown significant growth in relation to cargo handling, with all demand dependent on road transport. However, there is a proposal for the implementation of the EF-118 railway that would interconnect Rio de Janeiro and Vitória, serving the region of Port. This work seeks to economically evaluate the advantages of the implementation of the railway modal compared to the roadway already used in the region. Due to the intense flow of cargo in the Industrial-Port Complex, the possibility

of building a new highway, the RJ-244, is being studied, extending from the industrial district to BR-101. For this purpose, surveys were conducted to determine the average daily volume of vehicles circulating in the region, in addition to the different types of cargo transported and their relationship with Port. Based on the information collected in the Traffic Studies Report issued, it was possible to relate data and achieve at the value of the average annual daily volume for each category of cargo handled in the Port. Bearing in mind that in 2019, Port of Açú handled approximately 751 thousand tons of cargo and analyzing the estimated costs by ABIFER for road and rail transport, the approximate cost values for each one per ton of cargo per kilometer were reached. Comparing values, it is possible to notice that the cost of transporting cargo by rail corresponds to about 16.6% of the amount spent on transporting of the same weight of cargo by road, which means a considerable advantage for its implementation.

Keywords: Port of Açú; Highway; Railway; EF-118; Economy.

Resumo

Desde o início das operações em 2014, o Porto do Açú apresenta significativo crescimento em relação a movimentação de cargas, sendo toda demanda dependente do transporte rodoviário. Contudo, existe uma proposta para a implantação da ferrovia EF-118 que interligaria Rio de Janeiro e Vitória, atendendo a região do Porto. Este trabalho procura avaliar economicamente vantagens da implantação do modal ferroviário em comparação ao rodoviário já utilizado na região. Devido ao intenso fluxo de carga no Complexo Industrial-Portuário, estuda-se a possibilidade de construção de uma nova rodovia, a RJ-244, estendendo-se do distrito industrial a BR-101. Foram realizadas para isso pesquisas para determinar o volume diário médio anual de veículos que circulam pela região, além dos diferentes tipos de cargas transportadas e sua relação com o Porto. Baseando-se nas informações, coletadas no Relatório de Estudos de Tráfego emitido, foi possível relacionar dados e chegar ao valor de volume diário médio anual para cada categoria de carga movimentada no Porto. Tendo em vista que em 2019, o Porto do Açú movimentou aproximadamente 751 mil toneladas de carga e analisando os custos estimados pela ABIFER para o transporte rodoviário e ferroviário, chegou-se aos valores aproximados de custo para cada um por tonelada de carga por quilômetro. Comparando valores é possível perceber que o custo do transporte de cargas através de ferrovias corresponde a cerca de 16,6% do valor gasto com o transporte do mesmo peso de carga por meio rodoviário, o que significa uma considerável vantagem para sua implantação.

Palavras-chave: Porto do Açu; Rodovia; Ferrovia; EF-118; Economia.

Resumen

Desde el inicio de operaciones en 2014, Puerto del Açu ha mostrado un crecimiento significativo en relación con el manejo de carga, con toda la demanda dependiente del transporte por carretera. Sin embargo, existe una propuesta para la implementación del ferrocarril EF-118 que interconectaría Rio de Janeiro y Vitória, sirviendo a la región del Puerto. Este trabajo busca evaluar económicamente las ventajas de la implementación del modal ferroviario frente a la vía ya utilizada en la región. Debido al intenso flujo de carga en el Complejo Industrial-Portuario, se está estudiando la posibilidad de construir una nueva carretera, la RJ-244, que se extienda desde el distrito industrial hasta la BR-101. Para ello se realizó una investigación para determinar el volumen promedio diario vehículos que circulan en la región, además de los diferentes tipos de carga transportada y su relación con Puerto. Con base en la información recolectada en el Informe de Estudios de Tráfico emitido, fue posible relacionar datos y llegar al valor del volumen diario promedio para cada categoría de carga manejada en el Puerto. Teniendo en cuenta que en 2019, Puerto del Açu manejó a cerca de 751 mil toneladas de carga y analizando los costos estimados por ABIFER para el transporte por carretera y ferrocarril, se alcanzaron los valores de costo aproximados para cada uno por tonelada de carga por kilómetro. Comparando valores, se puede apreciar que el costo del transporte de carga por ferrocarril corresponde aproximadamente al 16.6% del monto gastado en transportar el mismo peso de carga por carretera, lo que significa una ventaja favorable para su implementación.

Palabras clave: Puerto del Açu; Autopista; Ferrocarril; EF-118; Economía.

1. Introduction

Port of Açu is located in the municipality of São João da Barra - RJ and has nine terminals that are divided into offshore and onshore. The operations at the port terminal began in 2014; today cargoes such as solid and liquid bulk, general cargo, iron ore and petroleum are already moving (Porto do Açu, online).

According to Mello (ABIFER, 2018), studies carried out by Prumo pointed out that, if Port was at the disposal of a railway, it could transport about 50 million tons of cargo in 2020, if it were in operating conditions that year; the modal would get to transport from 55 to 70 million tons in 2060. About 60% of this volume could be handled by the Port of Açu, that is,

the port would receive an average of 30 million tons in 2020 and 37.5 million tons in 2060.

Mello (ABIFER, 2018, p. 1) still ponders: “the great advantage of the railway is that, once installed, it will create a competitive scenario, lower cost and efficiency for customers, especially those of general cargo and agricultural bulk”. One of the main beneficiaries of the Rio-Vitória railroad will be the Multicargas Terminal (T-MULT), which handles coke, coal, bauxite and gypsum, in addition to general and project cargo.

According to the logistics company WM Trading (online), until the 1930 there was a greater emphasis on railway transport; however, the coffee crisis damaged this context due to the transport that was made by rail. Soon, the government nationalized the railway companies and promoted the transportation of cargo, reducing the relevance of passenger transportation.

One of the political promises in Juscelino Kubitschek government, “50 years in 5”, was to connect the Brazilian territory through a transport network. Such action would need to use a transport option of quick installation and operation, considering that the construction of highways takes less time than railways (WM Trading, online).

Cargo that arrives at ports, airports or train stations is loaded onto trucks and taken to its final destination. This logistics allows that the delivery to be made conveniently, being impractical, however, for greater distances. Road trips can generate excessive expenses, such as fuel and vehicle maintenance, in addition to being subject to theft and higher accident rates (WM Trading, online).

Due to this fact, there are several proposals for improvements, considering the most relevant one being the increase in railway participation in national logistics, which would require an improvement in its network. As Brazil is a continental country, there is a clear need to expand the railroad modal to overcome long distances in the logistics scenario, making transportation more efficient and with lower operating costs.

This study aims to compare the transport costs of railway and roadway modals with the implementation of the EF - 118 and describe the benefits achieved through the implementation of it.

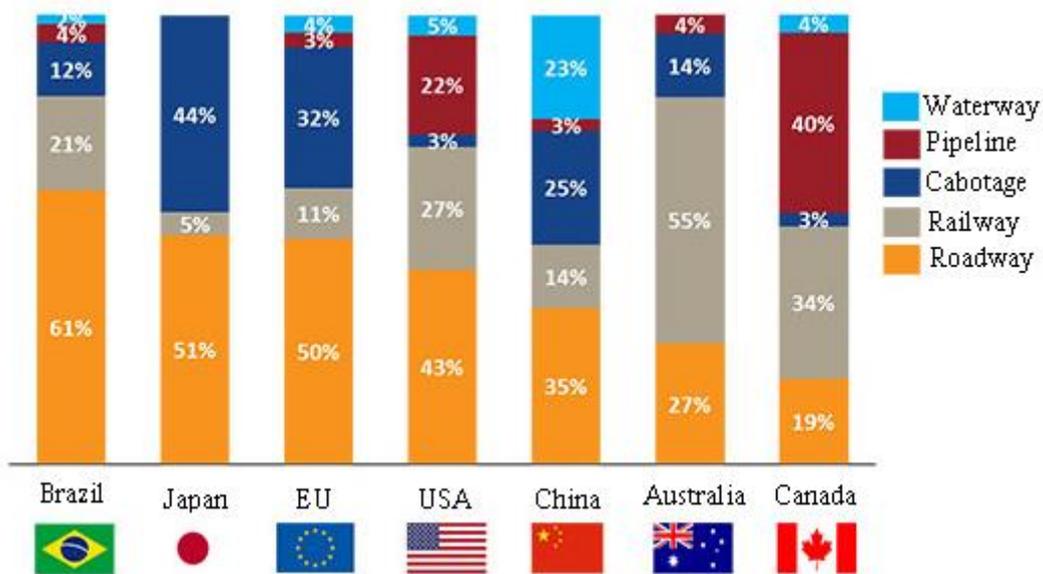
2. Methodology

In accordance with Pereira et al. (2018), in the academic scenario, the realization of new researches is of great importance to discover answers to problems or also to know and understand certain situations that happen in different areas of knowledge. In this research, the “quali-quantitative” method was used in which the numerical results are complemented by

qualitative results (Pereira et al., 2018, p. 100).

Even being a continental country, the transportation system in Brazil is predominantly roadway. According to ILOS (Institute of Logistics and Supply Chain, 2019), in 2019, Brazil's transport modal handled around 61% of its cargo by road system, 21% on railways, 12% on cabotage, 4% by pipelines, 2% by waterways and less than 1% by air. However, in comparison with other countries, it is possible to observe the imbalance between the transport modals, as shown in Figure 1:

Figure 1 – Country transport matrix compared to Brazil.

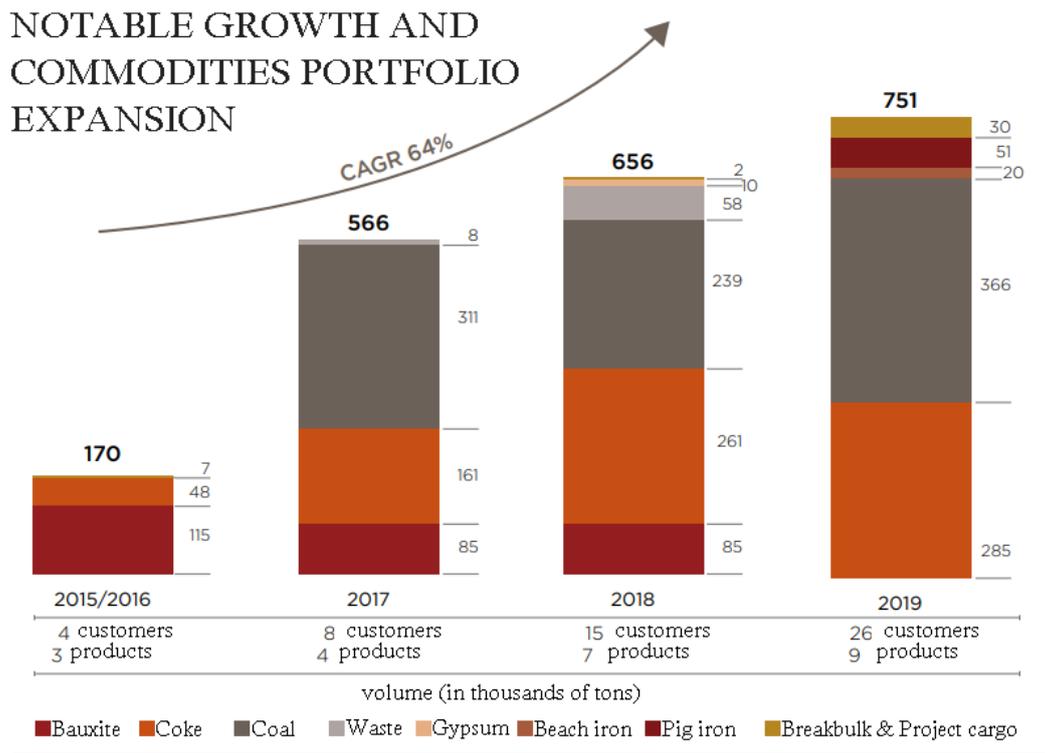


Source: Adapted, Brazilian transport matrix awaiting investments, (2019).

As shown in the previous Figure, it is observed that the predominant Brazilian transport mode is roadway and the same in comparison with the other countries presents in a greater proportion, in addition to the numbers between the modes not being relatively balanced.

According to the data presented by the Port portfolio (2020), it presents a progressive growth in cargo handling, as shown in Figure 2, which results in a high and growing logistics demand. The Brazilian Railway Industry Association (ABIFER, 2018) shows that the Port of Açu terminals are not suitable for handling by rail, thus being made only by road.

Figure 2 – Evolution of cargo handling at Port of Açu.



Source: Adapted, Doing business in Port of Açu, (2020).

Figure 2 shows the great development of Port in relation to previous years, this results in a special attention to the logistical means so that its flow of cargo is done in an efficient and economical way.

In agreement with the Planning and Logistics Company (EPL), still with a project in progress, the EF-118 Railway that proposes a Rio - Vitória interconnection (Figure 3), if implemented, it may bring benefits to Port do Açu and its region.

Figure 3 – Route of the future EF – 118.



Source: Adapted, Tribuna Online, (2019).

The previous Figure shows the influence that the EF-118 railway will have in relation to Port of Açu, once implemented, it will be able to transport its respective products through the railway modal to two different capitals, thus expanding its logistics option.

According to the Technical Evaluation Report of the layout of RJ-244, the access routes to the Açu Industrial-Port Complex from BR-101 are basically five: RJ-196, RJ-208, RJ-216, RJ-240 and BR -356. Due to the large cargo flow in the region, a new highway is being studied for possible implantation, the RJ-244 (Figure 4), in which a direct access from the Industrial District to BR-101 is proposed, containing an extension of approximately 44 km.

Figure 4 – Proposed route for RJ-244 (red).



Source: Adapted, Jornal Online Terceira Via, (2019).

As shown above, with vast access options to Port, an emphasis is placed on the study of a new highway for a direct connection from BR-101 to the port complex.

As a justification for the development of the RJ-244 project, traffic demand studies were realized in the Industrial District region. The Technical Report of Port of Açu Traffic Studies presents the values of annual average daily volumes calculated for all counting points, according to Table 1:

Table 1 – Annual Average Daily Volume (AADV) at Classified Volumetric Counting Stations.

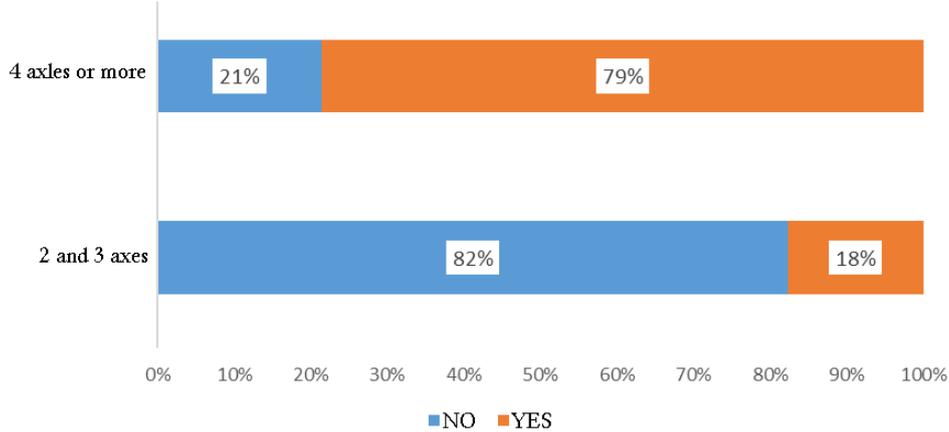
Post	Car	Commercials 2 - 3 axer	Commercials 4 axles or more
A1	1019	159	51
A2	581	83	33
B	5611	949	188
C	8430	1057	590
D	1128	331	510
A3	885	317	353
Total	17654	2896	1725

Source: Adapted, Port of Açu, Traffic Studies Report for RJ-244 Project, (2018).

The previous Table shows the annual daily average flow of vehicles passing through the region where the port complex is located and a relatively intense traffic is observed.

The main focus is on cargo handling specifically associated with Port of Açú. Based on interviews with drivers in the Traffic Study, a graphic was drawn up showing the trips related to Port, detailed in Figure 5:

Figure 5 – Percentage of trips related to Port of Açú.

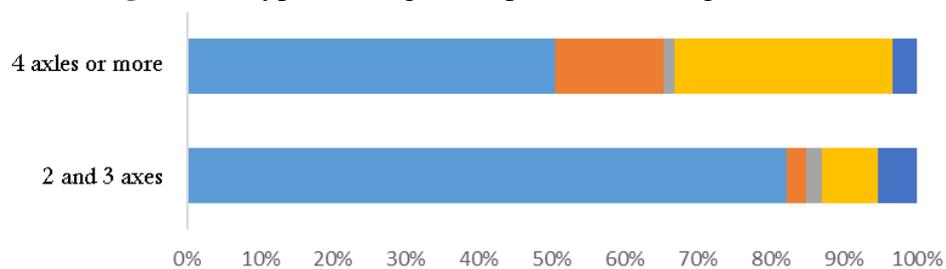


Source: Adapted, Port of Açú, Traffic Studies Report for RJ-244 Project, (2018).

Through Figure 5 it can be concluded, based on field research, that the largest flow of heavy loads is directed to Port. Making clear the need for a more specific route for such transport.

The categories of cargo transported by commercial vehicles in the region were also observed. Figure 6 shows the percentage of each one:

Figure 6 – Types of cargo transported in the region.



	2 and 3 axes	4 axles or more
General cargo / others	82%	50%
Container	3%	15%
Liquid bulk	2%	2%
Mineral bulk	8%	30%
Vegetables and fruits bulk	5%	3%

Source: Adapted, Port of Açú, Traffic Studies Report for RJ-244 Project, (2018).

With the predominance of cargo flow, as shown in Figure 6, the need for a new route alternative is certified, allowing that the transport is realized in a more versatile and economical way.

Correlating the data between the AADV and types of cargo transported in the region and the percentage of trips related to Port of Açu, it is possible to analyze the quantity of traffic volume (trucks /day) in the Port, according to Table 2.

Table 2 – Annual Average Daily Volume of cargo types associated with Port of Açu.

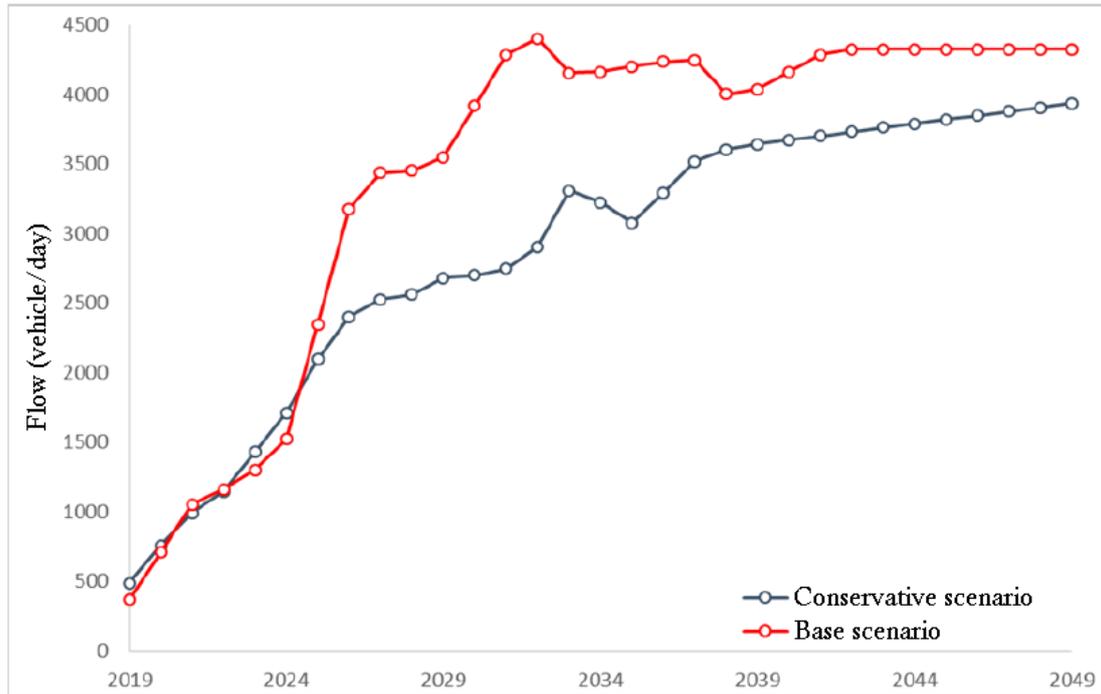
Traffic volume	Percentage 2 - 3 axes	Total 2 - 3 axes	Percentage 4 axes or more	Total 4 axes or more
AADV total local	100%	2896	100%	1725
AADV total Port	18%	522	79%	1363
Type of cargo and number of vehicles related to Porto's total AADV				
General cargo / others	82%	428	50%	682
Container	3%	16	15%	204
Liquid bulk	2%	10	2%	27
Mineral bulk	8%	42	30%	409
Vegetables and fruits bulk	5%	26	3%	41

Source: Author.

With Table 2 it is possible to analyze more clearly what the average number of vehicles for each type of cargo that is handled daily by the Port, it is also observed that the largest flow is of trucks with greater amounts of axles.

The traffic demand estimated for the base scenario fully considers the loads and volumes predicted in the Master Plan existing in the business plan developed by Port of Açu. Figure 7 below shows the volume of truck traffic predicted for the region in future scenarios, based on the projections informed by the Traffic Studies:

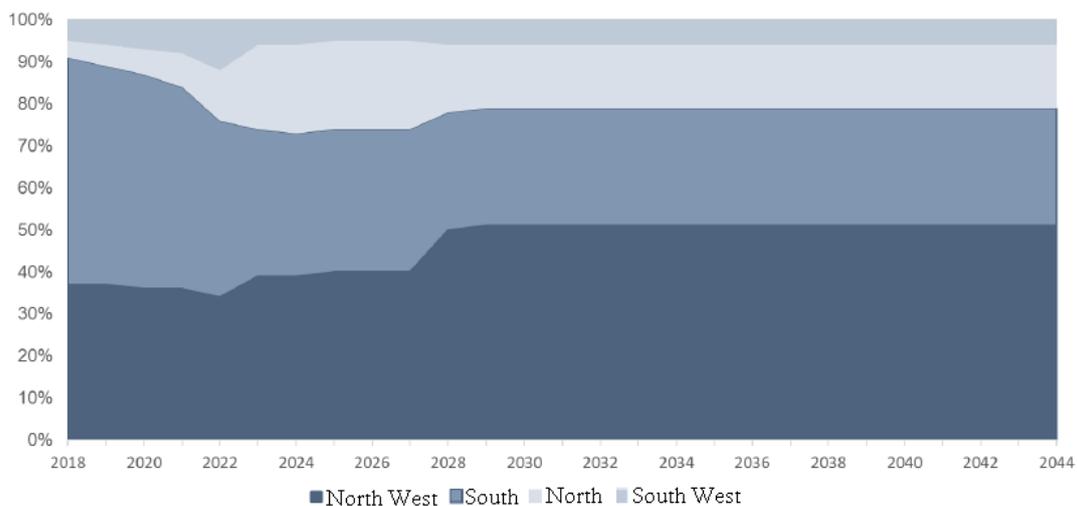
Figure 7 – Total truck traffic generated by cargo transportation to / from Port of Açú.



Source: Adapted, Port of Açú, Traffic Studies Report for RJ-244 Project, (2018).

The origins and/or destinations of each type of cargo for the entire concession horizon were also evaluated, according to their geographic location, in order to understand the routes by which they would arrive or leave the study area, thus evaluating their spatial distribution. The evolution of the relevance of each region in terms of trailer flow is shown in Figure 8. The flow in the south direction is the most relevant in the short deadline (however, over time, cargo from the north gains greater importance, reaching half of the vehicle flow in 2044):

Figure 8 – Relevance of each region in stream of trailers.



Source: Adapted, Port of Açú, Traffic Studies Report for RJ-244 Project, (2018).

It should be noted that cargo handling at Port of Açú is constantly growing and this performance reflect the increase in roadway transport, not only in the port region, but in the whole of the country, since Port does not have a railroad line. available and with the demand to serve the entire Brazilian territory.

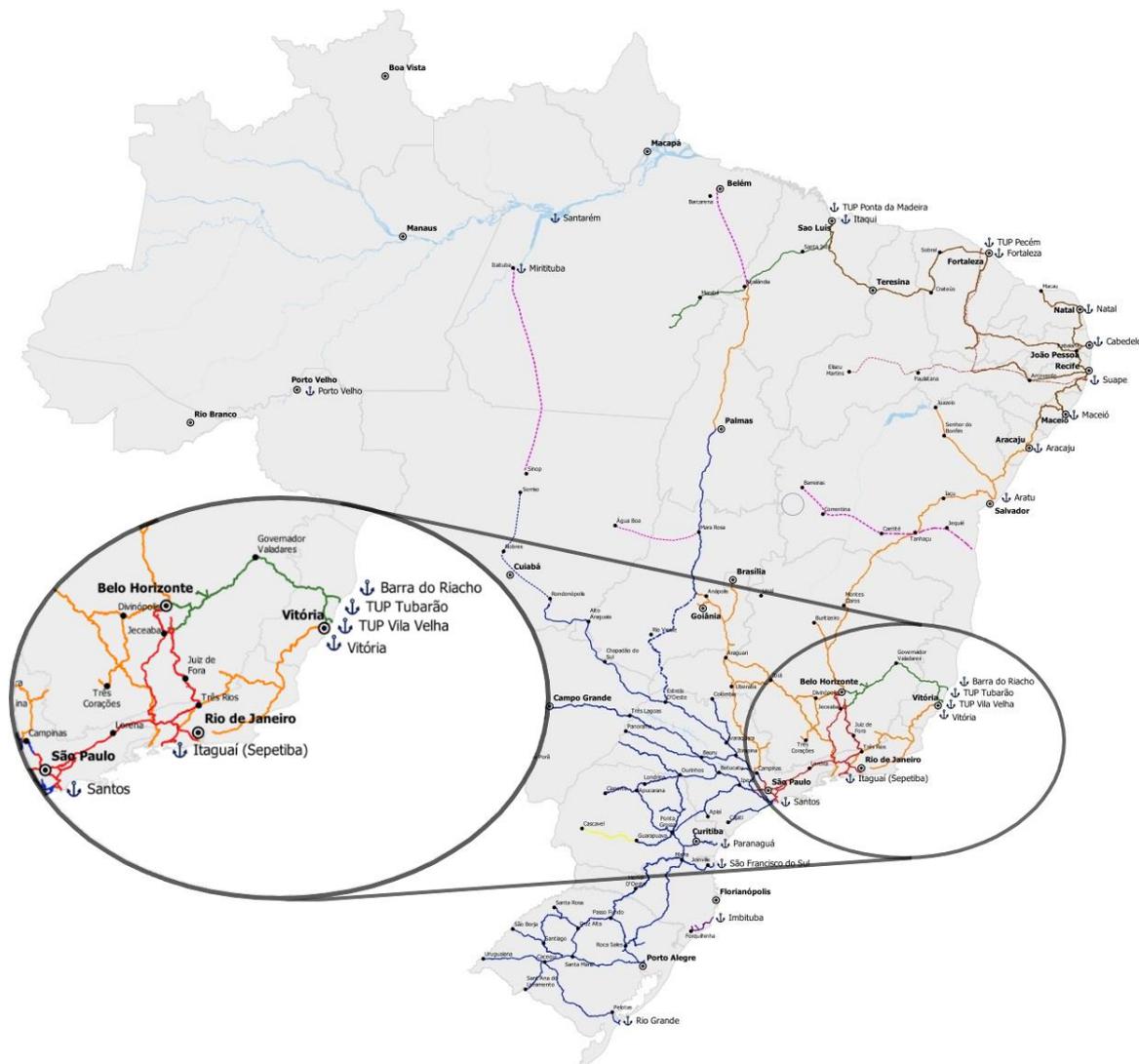
According to ABIFER (2018), there are 7 reasons to invest in cargo transportation:

- In 1 km, a truck consumes 13 times more energy than a train to transport a ton of freight;
- A single track pair of railroad is equivalent to an expressway with 14 parallel tracks;
- A 200 wagon train carries as much as 400 road trailers;
- Adding a single freight train to the network is equivalent to removing up to 280 trucks from circulation;
- Reduction in air pollution levels, especially when rail transport is powered by electricity;
- In the case of diesel-powered locomotives, the reservoir has a capacity of 15,000 liters (most trains can travel more than 1600 km without having to refuel);
- Highways carry three times more cargo than railways, but the cost is six times higher.

3. Results and Discussions

The cities of Rio de Janeiro and Vitória already have the railway modal, which are connected to several Brazilian states. With the EF - 118, the cargoes from Port of Açú will be able to be transported by rail, getting access to the railway networks in sequence of the mentioned capitals, completing a great extent by this modal. Figure 9 details the current rail network in the region, also bringing to the observation the condition of coverage for the expansion of railways:

Figure 9 – Brazilian railroad network.



Source: Adapted, ANTF, Railroad Map, online.

Through Figure 9, it is possible to see that with the construction of the EF-118 railway, Port of Açu could interconnect several points in the country, reducing the use of road transport and, consequently, an economy in this process.

Analyzing the current data for 2019, Port of Açu handled around 751 thousand tons of cargo, and its transport is done by road. According to ABIFER (2018), to transport a thousand tons of cargo through this modal in Brazil, it is necessary to spend around R\$ 259,00 per kilometer, while on railways this value is approximately R\$ 43,00.

Associating the values of the amount of cargo handling with the cost of transportation, Port in its logistics in 2019 spent approximately R\$ 194.509,00 in tons per kilometer. However, if it were also suitable for use by the railroad modal, the cost of transportation with this option of cargo destined for the railroads would present a considerable reduction in

comparison with highways, since its value in thousand tons per kilometer corresponds to approximately 16.6% of the road modal.

4. Final Considerations

Therefore, not only Port would benefit from the implementation, but also the highways in the region. The decrease in the flow of heavy traffic would result in an optimization of travel for other vehicles, in addition to the reduction of loads on the pavement and its impacts, which in excess can cause pathologies resulting in a drop in the safety level of drivers, discomfort in traffic, and consequent increase in maintenance expenses.

With this research, future discussions in the scientific community are expected to expand knowledge in the area. This data analysis can serve as a basis for further research in the industry, since the evolution of logistics is constantly growing. It is also desired that more research in the area of transport infrastructure be realized.

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