



Brazilian cargo road transportation infrastructure: globalization, logistics, policy and growth

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ABSTRACT. This paper analyzes the main economical and technical aspects of the Brazilian Transportation infrastructure, focusing on the roadway cargo transportation sector. It brings information, reflections and technical considerations concerning political, planning and strategic issues, addressing to the future of the sector and also the possibilities of growth. Summarizing, this paper presents, based on authors like Eric Hobsbawn and Amartya Sen, a contemporaneous overview of the infrastructure of the Brazilian roadway cargo system, considering the impact of the globalization and government policies, resulting from forecasting growth of the logistics and transportation sector in Brazil.

Keywords: brazilian cargo road transportation, roadway infrastructure, logistics.

Infraestrutura do setor rodoviário de cargas no Brasil: globalização, logística, política e crescimento

RESUMO. Este artigo analisa os principais aspectos técnicos e econômicos da infraestrutura de Transportes Brasileira, com foco no setor rodoviário de cargas. O trabalho contém informações, reflexões e considerações técnicas ligadas ao planejamento, à política e à estratégia, com vistas ao futuro do setor e também às possibilidades de crescimento. Em resumo, este artigo apresenta, com base em autores como Eric Hobsbawn e Amartya Sen, uma visão contemporânea da infraestrutura do sistema rodoviário brasileiro, considerando o impacto da globalização e de políticas governamentais, resultantes da previsão de crescimento da logística e do setor de transportes no Brasil.

Palavras-chave: transporte rodoviário de cargas brasileiro, infraestrutura rodoviária, logística.

Introduction

The global economic scenario

There is no doubt that we live in a more globalized economy than the one from 30 years ago, but we can assume that, with the same conviction, we will be even more globalized in 2100. Globalization is not a result from one single action, like turning on the lights or starting the car engine. It is a historical process which, nevertheless has been accelerated in the past 10 years, it reflects an intense transformation (HOBSBAWN, 2009, p. 61).

Considering the internationalization of the economy, according to Hobsbawn (2009), from the Transportation and Logistics point of view, the world has become a large logistic plan: as far as some countries create the projects, other can provide raw materials, other countries contribute with workforce, and, in some markets, more intensively, the consumption takes place.

In this sense, according to Sen (2008, p. 145), "The role of the markets must depend not only on what it can do, but depends on what it is allowed it to do".

The author considers mainly the liberalism, the trade issues, national and international agreements on entrepreneurial freedom, provided from the State. In such scenario, the role of infrastructure, provided from the State, is critical to any kind of integration of the world economic order.

If we look at car manufacturing industries, for example, at the classic case of multi and transnational companies that migrate from their countries to others, in which a new assembly plant takes place, hiring local employees, previously qualified or formed in loco, in many cases having the high management hired from other regions, from the same country or from foreign countries.

Besides, there are supplies produced in the same country and some other imported supplies from different places of the world, counting on

technology and mixed/combined processes, like production layout based on North-American and Japanese paradigms. Thus, it is produced automobiles, that can be exported as well, to other market, anywhere.

The Figure 1 shows an international logistic plan:

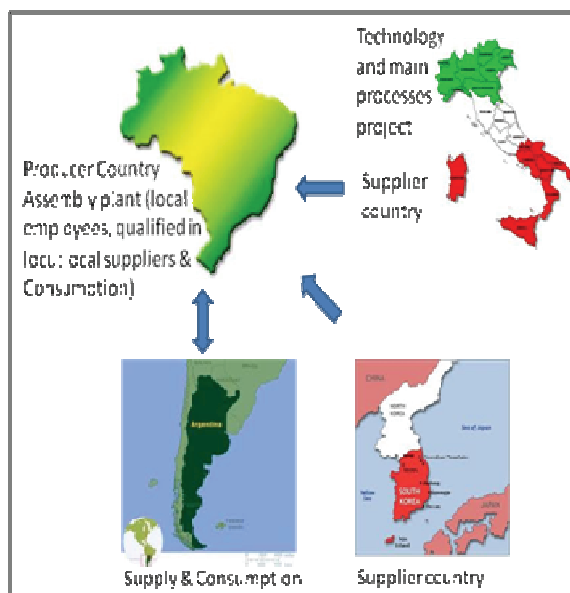


Figure 1. International Logistics plan. Source: the authors.

According to Porter:

[...] the unique meaningful concept of competitiveness at the national level is the national productivity. A thriving on life pattern depends on the capacity of the enterprises of the country to reach higher levels of productivity and to increase it as the time passes by [...] (PORTER, 1993, p. 6-7).

Thus, is it possible to point that competitiveness of the productive sector is associated with an efficient logistics. The growth and the increase in the capacity of companies are based on the role of the economic environment, developed by organizations and also by national policies. These are attributes of a nation that stimulates the competitive advantage in an industry.

Porter (1993) states that there is a need to abandon the idea of a competitive nation as a meaning of economic prosperity. He also says that the productivity of the enterprise is what really influences and determines the levels of economic prosperity of a certain country. The author also considers that no nation can be competitive in everything. There is no way to be an exporter of everything, which characterizes the sector focus of his analysis.

Considering the approach of Sen (2008), in order to provide development with freedom to society, it is needed the state as a provider of infrastructure and

minimal conditions to the entrepreneurs produce, and enjoy such freedom.

In transportation and logistics field, it can be observed that the Brazilian state has been developing, in the past few years, strategies and planning, in order to provide minimal conditions, like the PNLT (National Plan of Logistics and Transportation) and PNLP (National Plan of Port Logistics), and other documents and policies, which are commented below, in this paper.

The national economical scenario

Several economical activities demand high scale of production: following the previous stream of thought, at regional or local level, production centers are created, like manufacturing industry or even agribusiness.

Consumption is concentrated in the urban centers, where there is more population, more resources and higher income. Therefore, internally, in any country of the globalized east, in order to supply its internal market, it is required an efficient link between production and consumption, which in turn, demands efficient logistics.

Lately, the search for efficiency has been based on technological tools, and also management tools, which allow, for instance, route optimization, monitoring and control of supply and distribution. It can be observed in the availability of planning and production control systems, integrated to the whole chain, added to the usability of the Supply Chain Management – SCM approach.

In order to concretize the logistic planning and also to guarantee the monitoring and optimization of the whole logistic chain, it is critical the adequacy of the logistics and transportation infrastructure. At the state level, and also considering the adoption of a state policy, it is fundamental the planning of the infrastructure, subject explored next.

Infrastructure planning scenario

From 1850 to 1950, in Brazil, the more used modal was the railways. The Petropolis, Railway, which started to operate in 1858, in Rio de Janeiro State, reached 16 km. In 1953 railways in Brazil reached 37,200 km.

The first railway in Brazilian territory was inaugurated yesterday. The speed of such a powerful invention of the human science was an object of Brazilians faith so far. Today, for a large number of them, the thing is real and experimented: the Mauá railway is inaugurated, with due solemnization. Religion blessed such vehicles, whose destiny is to produce a true revolution in our industry; human authority consecrated it, the enthusiasm revealed the veil of the future, acclaimed the priceless progress of Brazilian civilization (COMMERCE JOURNAL, 1854, p. 1 in ANPF, 2011)

It is important to note that such reference comes from 1854, and that there was a perception about the future of that mode of transportation.

According to Valente (2008):

The railway is not considered a kind of monopoly in transportation because there is no such thing. It is considered just one carrier among others, which is going to offer services to its clients (VALENTE, 2008, p. 153).

The author complements by asserting that:

Railways are looking for improvements in its offerings, establishing not only transportation, but also a complete service, which will take care of the cargo, as closer as possible to the production sources (VALENTE, 2008, p. 153).

It can be observed, in such way, a contemporaneous view for railways: a logistics view.

From 1950 to 2000, the roadway modal had its great impulse, when the Brazilian automobile industry, including trucks, powered by diesel, and the roadways got investments from the Brazilian Federal Government.

There was a period called 'brazilian miracle', in 1970, in which the international prices of fuel started rising. It was the international oil crisis, started in that decade. Thus, at that time, researches about alternative fuel, like ethanol and biodiesel, started.

Valente (2008) affirms:

[...] one of the typical issues on fleet operation in road cargo transportation is the collection and distribution. Such matter is related to the logistics and transportation scenario (VALENTE, 2008, p. 181).

In the XXI century, also as a result from globalization of the economy, already defined by Hobsbawn (2009), the logistics view is more present by the need, mainly in Brazil, of resources optimization, after the stabilization of the Brazilian economy, and the consequent new perspective and necessity to know the costs structure, to reach feasible and competitive prices for transportation and logistics services.

Material and methods

The following activities, approaches and methodologies were carried out to develop this research:

Based on recent government publications and official documents the authors present information, reflections and technical considerations concerning political, planning and strategic issues, addressing to the future of the sector and also the possibilities of growth.

From authors like Eric Hobsbawn (2009) and Amartya Sen (2008), it is provided a qualitative and contemporaneous overview which is compared to actual data of the infrastructure of the Brazilian roadway cargo system (characterized as a quantitative approach). The authors also consider the impact of the globalization and government policies, resulting from forecasting growth of the logistics and transportation sector in Brazil.

The scope of the cargo roadway sector infrastructure logistics

Stewart and David (2010) define logistics as follows:

The part of the process of the supply chain, which plans, implements and controls the two-directional flow (forwards and backwards), effective and efficient, besides related cargo, services and information storage, from the origin to the consumption point, with the purpose to serve the clients needs (STEWART; DAVID, 2010, p. 22).

In such cases, road infrastructure is critical to logistics, considering every modal. When the roadway modal has been considered, these authors present the conception of the Brazilian roadway system, composed by roadways and users, cargo and passengers vehicles.

Stewart and David (2010) affirm that the roadway quality of a country, concerning the total mileage of the roadways and also the percentage of paved roadways, is usually described in official documents.

The authors report that in Argentina, for instance, the ratio between miles of paved roadways and the total mileage of roadways is 29.5%. In U.S. the ratio is around 90%.

Table 1 lists some data on paved roadways in Brazil and in the countries which compose BRICs: Russia, India and China (not considering South Africa).

Table 1. Paved roadways in the BRICs.

	Paved (km)	Total (km)
Brazilian Federal Road network	63,000 (52.9%)	119,000
Brazilian Road Network	200,000 (11.3%)	1,700,000
Russia	600,000	
India	1,500,000	
China	1,500,000	

Sources: adapted from the authors from CNT (2010) and ABIMAQ (2010).

The contrast is remarkable: comparing the total length of Brazilian roadways (paved and not paved) with Chinese paved roadways, for instance, it can be observed that in Brazil there are 200,000 km more than in China. On the other hand, if we consider the unpaved roadways, Brazil has 1,300,000 km less than China.

Stewart and David (2010), considering the percentage of paved roadways, assert that:

Such data can be misleading since the majority of the traffic takes place on paved roadways, and unpaved roadways serve to rural areas. Besides that, the conditions of a paved roadway have high impact on its usefulness; a two lane roadway jammed and full of holes is not enough safe for cargo transportation (STEWART; DAVID, 2010, p. 45).

It is understood that the percentage of paved roadways is not the only one indicator of infrastructure growth, but certainly is an important one.

Moreover, according to the authors, in Calcuta, India, the average speed is around 8 km per hour due to constant congestions. In São Paulo city, we observe records of average speed close to India statistics, and there is also another urban indicator: the total mileage of traffic jam in the city, which is the sum of several stretches presenting average speed below the service speed.

Regarding the number of transportation companies and the fleet of cargo vehicles in Brazil, presented as follow, in Table 2, there is around 1,500,000 vehicles, and an average of 2,6 vehicle by transportation company.

Table 2. Cargo road transportation vehicles and fleet in Brazil.

Type of transportation company	Number of Registrations	Vehicles	Vehicles / Transportation company
Autonomous	467,526	669,234	1.4
Enterprise	82,769	768,738	9.3
Cooperative	247	10,786	43.7
Total	550,542	1,448,758	2.6

Source: ANTT (2011).

The role of infrastructure in the cargo road sector in the logistics and economic scenario

Logistics Scenario

Stewart and David (2010), affirm that:

The roadway infrastructure of a certain country is evaluated in a different way than the other modalities of transportation. There is no country with lack of roadways; however, there are issues concerning the quality and maintenance of the network, and also its level of service (STEWART; DAVID, 2010, p. 45).

According to the Brazilian National Plan of Logistics and Transportation – PNLT (2010), in Brazil, the roadway modal covers 60% of the total cargo. It is known that in Brazil a truck can travel from South to North, more than 3000 km, and that the conditions of the pavement, in the same national roadway, can vary according to its use: proximity of urban areas, ports, and/or regional

geographical conditions, like mountains, foothills and hill sides.

Thus, it can be considered the influence of geography on the roadways design, which can affect the level of service and its usability.

Economics

The specialized literature considers transportation as a support activity, which does not aggregate value to the product transported. However, such area is critical to the economic sector.

From the Logistics point of view, transportation is considered a fundamental instrument to generate economical and regional development. According to Brazilian Association of Machines and Equipment Industry – ABIMAQ (2010), the Cost Brazil makes a certain agricultural product produced in Brazil to cost 36% more than the same product in U.S.A. or Germany.

Roadway modal task

When the roadway modal is the subject, we must consider the features applied to the cargo transportation of short and medium distances, since for longer distances it might not be the most adequate: it loses in competitiveness and costs for railways and maritime modals.

Anyway, the roadway modal is the only one which offers a connection door-to-door, and is also fundamental to integrate and make other modals feasible.

The Figure 2 below extracted and adapted from Rodrigue (2007) shows transportation costs per modal by the distance. It can be observed the feasibility of the roadway modal for shorter distances, and also the feasibility of the maritime modal for longer distances. The best choice for intermediate distances is given to the railway modal.

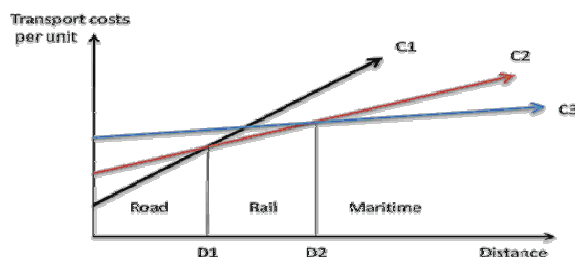


Figure 2. Transportation cost x transportation modal. Source: the authors.

The roadway modal presents more flexibility of routes, according to the availability of the network and; higher ability for transportation of goods having medium and high aggregated value,

due to speed of operations and the customized treatment of the cargo.

Results and discussion

Strategic aspects and insertion into the planning

Perrupato (2010) asserts that low levels of investments in Brazil, especially in infrastructure, generated problems that must be overcome. Such problems are distributed for all transportation modal, also generating: inefficiency, additional costs and accidents. Such idea ratifies the need of a strategic and planning approach, in order to make concrete the improvements required by the transportation sector.

Brazilian government has taking actions in such sense, highlighting, in the public sector, the national plans and decision support systems, some listed below:

PNLT-National Plan of Logistics and Transportation (PNLT, 2010);

PNLP-National Plan of Port Logistics (Ports Secretary – Republic Presidency – PR (PNLP, 2012);

PHE-Strategic Waterways Plan (Transportation Ministry – MT (PHE, 2013);

PNIH-National Plan of Waterways Integration (PNIH, 2013);

SISLOG-Logistic System (ANTT, 2011);

SGV-Roadway Georeferenced Information System (DNIT, 2010).

In the private sector it can be highlighted the SIAM, a system developed by the Transportation and Logistics Laboratory (LabTrans), of the Federal University of Santa Catarina – UFSC, for Petrobrás. The first version of SIAM was developed and implemented in 1998, which has been updated and improved since then.

Growth forecast for the transportation sector

Brazilian GDP evolution

From the Figure 3, it is important to consider the scenario of the transportation sector, therefore, from data presented by Brazilian Institute of Geography and Statistics - IBGE (2011), the Brazilian Gross Domestic Product, GDP, in 2010 increased 7.5% and in the previous year (2009), the impact of the international economic crisis was not very significant since the GDP presented a 0.6% deficit.

Investments in the transportation sector

Perrupato (2010) focuses on the recommendations of the National Plan for Logistics and Transportation, from 2008 until 2023:

The PNLT recommends investments of R\$ 74.4 billion in transportation infrastructure in the roadway modal for the period between 2008 and 2023, in which

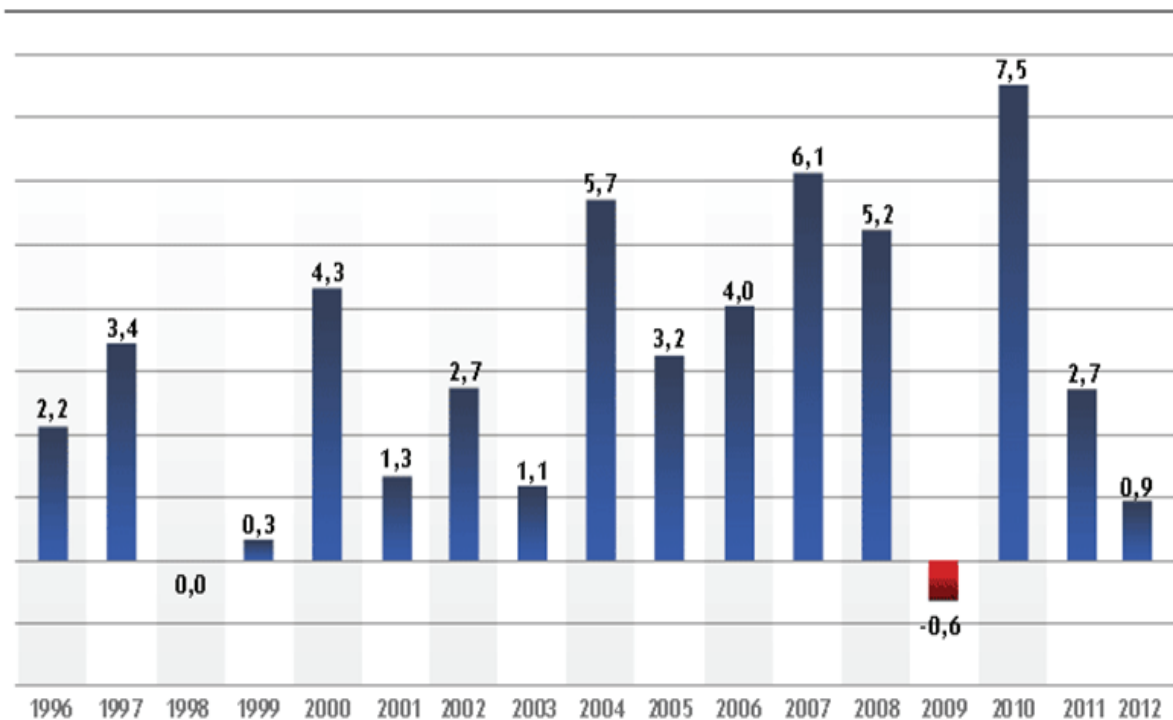


Figure 3. Performance of Brazilian economy. Source: IBGE (2011).

must be considered 16 billion, estimated as necessary by DNIT for maintenance and conservation of the network until 2016 (PERRUPATO, 2010, p. 23).

Figure 4 illustrates the investments of the Brazilian Government, from 2002 to 2010:

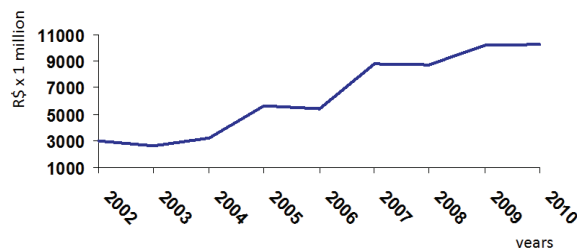


Figure 4. Evolution of the budget availability of the Ministry of Transport for the roadway modal. Source: Perrupato (2010).

Usually it is competence of the government the efficient regulation of the transportation sector, the responsibility for investments and mainly for the infrastructure. However, in the latest years, was observed the need for the participation of the private sector in logistic infrastructure projects, like roadways concessions and port operations.

Highlights of PNLT: guidelines for roadways

In order to exemplify the government competencies, we report some actions contained in PNLT:

As strategic guidelines: duplication and capacity adequacy, construction and paving. In urban areas it is designed the construction of bypasses and crossings.

Another target of PNLT, according to the Pavement Management System – of DNIT (2010) is the increasing the percentage of the network, qualified as ‘good and excellent’, to 60% until 2014, eliminating the percentage corresponding to ‘bad and very bad’.

Considering Hobsbawn (2009), it is concluded that the globalization process and the economy internationalization is more than a consolidated trend. The globalized economy has demanded more infrastructure and also integration for Logistics and Transportation.

We can add to such requirement the necessity of efficiency in logistics in order to keep the competitiveness of the productive segment, by reducing logistics costs, especially in the industry which produces high aggregated value products.

In a future forecast, in a macro scenario, from the irreversibility of globalization and its impacts over economy and over local, regional and global production systems, it is fundamental the existence of state policies and not only governmental policies, to

allow the transportation and logistics system to adjust and to equalize to international competitors, to attend internal and external market with quality.

Conclusion

Concluding and proposing a future view, focusing specifically on the transportation segment, it can be pointed the need to consolidate the new role for the cargo road sector:

Roadway network must be integrated to a logistic system, involving railways, waterways and aerial modal, integration terminals, integrated logistics centers (CILs) and connecting, with lower costs to producers and consumers.

Carriers must adapt and became logistics operators.

Productive sector must start efficient logistic planning.

All of this will maintain stakeholders more competitive and will keep the country thriving on and evolving.

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