CONTRIBUTION TO THE REDUCTION OF THE NEGATIVE EFFECTS OF ROAD FREIGHT TRANSPORTATION IN URBAN CENTERS IN BRAZIL BY USING CITY LOGISTICS

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ABSTRACT

In Brazil, the transportation of goods throughout the national territory is most commonly done by road. Besides representing recurrently high costs, such practice also causes impact on road space, thus altering the infrastructure of cities and increasing travel time in urban centers.
This study aims to present a proposal of guidelines to reduce the negative effects of road freight transportation on the road transportation system in the urban centers of Brazil, regarding travel time, particularly the transportation system in the Southeast Region, an important area connecting the north-south axis of the country.

Keywords: road freight transportation, reduction of negative effects, urban distribution of goods, city logistics.

INTRODUCTION

Over the years, with the intensification of economic growth, the urban and metropolitan areas have suffered impacts on their transportation system, especially on urban transportation, due to the transit of goods, which must be displaced to supply different areas, which may lead to traffic congestion.

Freight handling in urban areas and their surroundings is not new and has become an issue of significant magnitude. Among the different aspects identified in this problem, the main ones are:

1. traffic flow and congestion;
2. the different transportation regulations and the different characteristics of each city;
3. the different types of vehicles used in the delivery and distribution of goods.

These and other related points lead to the inference that, in urban transportation planning, the factors and variables associated with it have not been properly considered. Moreover, this plan has been rapidly changed over time, since there is now a growing awareness of society about the impacts of road freight transportation in cities.

Such impacts have negatively influenced the quality of life of the population, the development of an adequate public transportation system and the growth of cities. These negative influences can be verified by the growing number of traffic accidents, traffic congestion, delay in passenger's travel time and delay in loading/unloading goods, and also by a substantial increase in noise and air pollution.

The impacts caused by road freight transportation on road systems and transportation in urban areas, as well as the influences on their surroundings, are a problem in Brazil.

Although there are methodologies to assess these impacts in urban areas, as observed in studies on the subject (TEIXEIRA FILHO, 2009), there are still no large-scale guidelines, in the Brazilian literature on transportation, for reducing the negative effects of travel time.

Given this context, it is necessary to perform an analysis on the negative impact of travel time caused by road freight transportation in the urban distribution of goods. For this purpose, it is necessary to develop a proposal based on methodologies such as the modern concept of city logistics and the complexity of urban freight logistics, which should be able to guide the development of a conceptual model containing specific guidelines that will help reduce the negative effect of this impact.

The objective of this paper is to make a contribution with new guidelines present in a conceptual framework for reducing the negative effects of the impact of travel time, caused by road freight transportation on the transportation systems of midsize cities in Brazil.

CHARACTERIZATION OF URBAN DISTRIBUTION OF GOODS

The road freight transportation in urban areas causes much disruption to the local population. Moreover, the urban structure and the actions that have been taken by the municipal authorities in order to reduce the problems caused by such disruption decrease the accessibility of the population, the urban mobility, the efficiency of the urban transportation system for people and the urban freight distribution logistics.

This fact is confirmed by Melo (2002), in his research, according to which the main feature observed in the historical evolution of the freight transportation sector in Brazil, from the fifties, was a disproportionate and accelerated growth of road mobility in the movement of goods and services.

In 1950, road transportation in Brazil amounted to only 38% of all domestic freight transportation. In 1960, with the development of Brazilian highways funded by public resources, this transportation mode corresponded to approximately 60% of the national transportation matrix, and such percentage has been kept so far (BNDES, 2008 and PNLT 2008).

Due to the poor conditions of the road systems in cities, the distribution of goods in urban centers has suffered significant economic losses, which amounted to approximately 500 million reais annually, as reports Sanches Junior (2008). According to a study from IPEA (2010), at the end of the 2000s, these losses amounted to over one billion reais.

Taniguchi and Heijden (2000 *apud* Oliveira *et al.,* 2012) point out that urban freight transportation should be an important component in urban planning. Its rationalization is essential for sustainable economic development.

Urban freight transportation, which according to Dablanc (2006) is usually about ¼ of the total of a city transit, is a necessity and a reality that all society should be able to live with. Without urban freight transportation there would be no economic activities to support the development and growth of the cities.

This finding was later corroborated by Caixeta-Filho and Martins (2007), who claim that the freight handled in an urban environment provides a picture of how urban areas cannot exist without a solid, reliable and sustainable flow of goods.

This assertion is also supported by Oliveira (2007), who states that urban freight distribution occurs in areas that are characterized by a concentration of residences and commercial activities, taking on great relevance in the transportation system, for representing an important component in the economic development. However, the consequences of this distribution, such as traffic congestion, pollution, noise and vibration, reduce welfare, accessibility and attractiveness of urban areas.

The supply of goods in cities, through the roads, coupled with the speed of its population growth and its rapid housing expansion, has been observed over the years. In practice, it has brought many consequences for the development of cities, and especially in Brazil. It is possible to verify a change in the functionality of the road system, the misuse of the urban transportation system, a lack of proper planning that includes appropriate guidelines for urban freight logistics operation, besides interference with the quality of life of the population, and even a change in people's behavior while conducting their vehicles in traffic, among other factors.

The importance of the distribution of goods lies in the fact that, according to the United Nations, 70% of the world popullation live in urban areas, besides the fact that the majority of industrial production sites also concentrate in such areas. In Brazil, this number is 81%, according to the IBGE census (OLIVEIRA *et al.,* 2012).

According to Portal (2003 *apud* OLIVEIRA *et al.,* 2012), the urban distribution of goods is part of the transportation chain and has its own characteristics. Although integration plays an important role on the coordination of the chain as a whole, currently this chain is not integrated. In the context of freight transportation, a transportation chain consists of a sequence of organizational and technical events by which goods are moved.

Thus, the problem of freight transportation in urban areas should be seen as a particular issue, regarding the difficulties that the freight sector faces in its transportation.

According to Browne *et al.* (2005 *apud* Oliveira *et al.*, 2012), urban freight transportation has a significant relevance in sustaining the lifestyle of the population; it plays an important role in the maintenance and repair of industrial and commercial activities; enhances industrial competitiveness; causes effects on the costs of the products consumed by the population, directly impacting the region's economic efficiency; has consequences for the environment, related to energy consumption, pollution, noise, visual intrusion, among others.

Sanches Júnior (2008) says that “the disproportion between the number of circulating vehicles and the road network makes the city live with a progressively increasing traffic congestion”.

Sanches Junior (2008) also points out that, for many drivers, the presence of trucks on urban roads is a source of discomfort and stress, as trucks may disturb the ability for cars to move around, due to their vast width and slower acceleration. For Lima Júnior (2003), city dwellers want the comfort of buying online, by phone, using delivery services, but they will not tolerate a commercial vehicle on the city streets, emitting noise and pollutants.

Therefore, it is important and desirable to go on a deeper analysis on the issue, like reducing the negative effects caused by the impact of travel time of road freight transportation in the main urban centers, regarding the urban distribution of goods.

KEY ISSUES RELATED TO THE MOVEMENT OF FREIGHT IN URBAN CENTERS

Freight handling in urban areas, especially in big urban centers or midsize cities on the way to other locations, is performed primarily by road vehicles, because it is a system that can be easily implemented and because of the already existing infrastructure. This fact is evidenced by the inability to deliver other modes of transportation, on a direct producer-consumer basis, and it is considered the only door-to-door mode.

The concentration of population in urban areas, observed in most countries, has led to change in consumers' habits. Sanches Júnior (2008) states that due to a wide variety of products offered, consumers tend to reduce the size of orders. This entails an expansion of the numbers of buyers and collection/delivery points, increasing the complexity of logistics operations, which must meet various consumers with a greater number of trips.

According to data from the Ministry of Cities – MINISTÉRIO DAS CIDADES (2006), the nine major metropolitan areas of Brazil concentrated 30% of the urban population, and the great majority of this population are poor, although it is known that the urban center of cities is defined by the Ministry itself as the economically viable place to host commercial areas, providing a wide variety of jobs, business types and access to a wide range of goods and services.

There is a significant growth in the movement of freight vehicles in order to properly supply these centers, which further increases the rates of travel time of road freight transportation and, consequently, leads to more traffic congestion in cities.

Figure 1 shows a schematic of the main types of problems caused by freight transportation in urban centers, in the view of the Organization for Economic Cooperation and Development – OECD (2003).

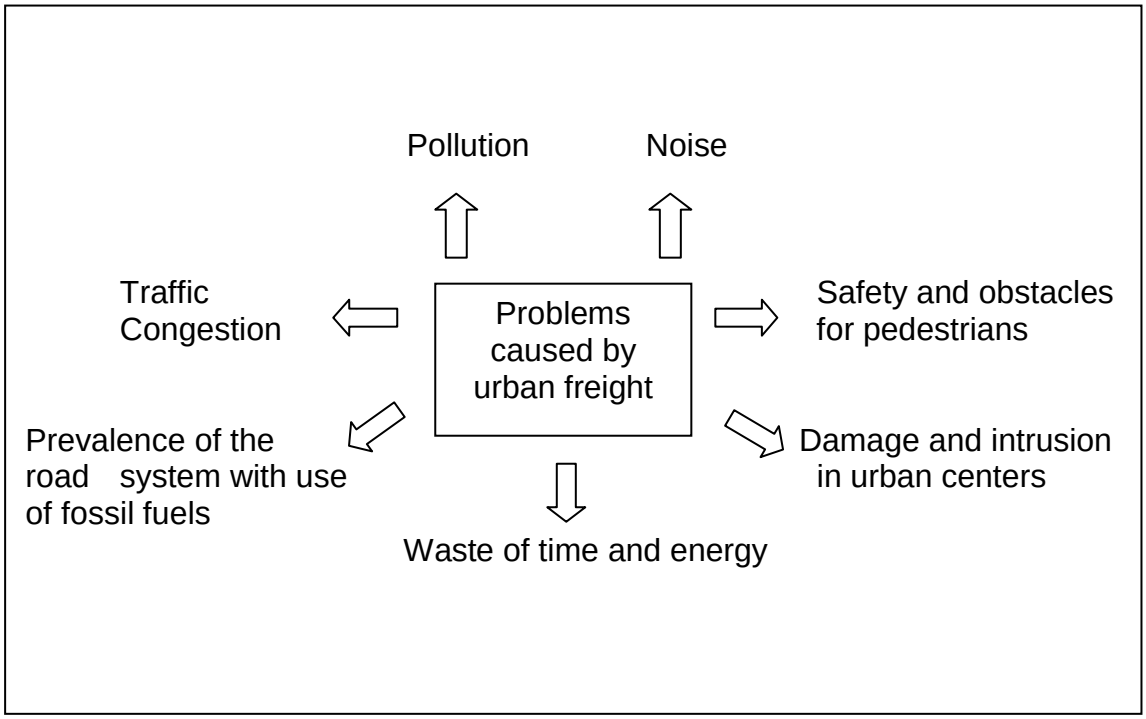

Figure 1: Major problems of freight transportation in urban centers
Source: OECD (2003).

According to Figure 1, traffic congestion is one of the major urban problems caused by urban freight. This congestion is due, among other factors, to the travel time of road vehicles transporting freight, which make traffic slower and more difficult thanks to their size.

In Brazil, the government's investment policy has favored the individual mode of transportation instead of collective ones. This led to the congestion of the road system, which is frequently seen in the cities in Brazil, due to the continuous freight traffic, increasing problems related to noise, vibration and air pollution (MINISTÉRIO DAS CIDADES, 2006).

Thus, the main problems found in the transportation system of the most important Brazilian cities and also midsize cities and the main urban centers in Brazil can be compared to urban centers in other emerging countries, given the similarities of these problems, as described in the research literature. These issues relate not only to the rapid growth of the fleet of vehicles circulating in the cities, but also the fleet of freight vehicles, which have been influencing and impacting the urban transportation system, due to a lack of appropriate policies for distributing goods in such locations (GUSMÃO and PEREIRA, 2011).

Table 1 shows a list of the main types of problems found in the movement of freight in urban areas, as highlighted by Gasparini (2008).

Table 1: Problems associated with urban freight movement

Problems	Congestion	Pollution	Safety	Energy Consumption	Operation Costs
PHYSICAL CHARACTERISTICS OF THE ROUTE OF A TRANSPORTATION SYSTEM					
Road Capacity			X	X	X
Traffic Control Device	X	X	X		X
Air and Land Obstacles to Trucks	X		X	X	X
CHARACTERISTICS OF THE TRANSPORTATION SYSTEM AT LOAD/UNLOAD POINTS					
- inadequate facilities for off-street loading	X		X	X	X
- inadequate design and access to freight facilities off-street	X		X		X
- inadequate freight facilities on the street			X		X
- physical obstacles to loading			X		X
OPERATIONAL POLICY FOR THE INDUSTRY TRADE					
- Limitations on the use of reception facilities	X	X		X	X
- lack of specialized equipment for handling freight	X		X		X
- driver performing operations	X				X
INCREASE IN THE AMOUNT OF FREIGHT VEHICLES					
- Increase in total load	X	X		X	
- increase in the amount of small orders	X	X	X	X	X
- increase in the amount of private freight	X	X		X	X
GOVERNMENT POLICIES					
Lack of restrictions on loading/unloading operations	X			X	X
Land use planning	X	X	X	X	X

Source: GASPARINI (2008).

According to Table 1, the problems are similar for both the road user and the consumer. That is, there may be an increase in travel time in commuting from home to work or entertainment, or there may be delays causing discomfort, difficulty in parking, pollution, or a decrease in safety for drivers and pedestrians, thus interfering with the quality of life in cities.

According to Gasparini's research (2008), **"**the negative effects of urban distribution of goods, such as pollution, noise, visual intrusion and deterioration of road infrastructure are also felt by the elements of the system that are involved in the process (recreational vehicles, people, freight, freight carriers, among others). Each has a different view on each perceived impact".

According to Goldman and Gorham (2006), in general, the fundamental characteristic of the proposed actions for the transportation sector worldwide is the complexity of the system, which keeps frustrating the development of policies for the sector.

Changes in the transportation system invariably involve inducing changes in human behavior, which leads to the complexity of the problem and which is normally neglected in the assessment of a new strategy for the sector, according to Sanches Júnior (2008).

The author also points out that, given this uncertainty, urban freight transportation, which supports the economy of urban centers, is still treated as a matter of secondary priority in city planning policies.

Such consideration may be observed in what is established by the National Policy on Sustainable Urban Mobility – PNMUS (BRASIL, 2004): a proper treatment is required for the urban freight transportation, since there are a number of elements involved in order to effectively perform this type of logistics, in view of the different types of impacts, conflicts, competition for physical space and others.

Considering the problems identified by the literature review on the topic, it is important to present the main impacts of road freight transportation in urban centers.

IMPACTS CAUSED BY ROAD FREIGHT TRANSPORTATION

In the major urban centers of large and midsize Brazilian cities, there is a lack of proper infrastructure and adequate logistics for operations that promote efficiency in the process of loading/unloading goods.

The plan for the transit of freight vehicles in Brazilian cities largely consists of city zoning into areas and corridors, depending on each location's capacity to allow the transit and parking of these vehicles according to the size and needs of each area. The ability to allow truck traffic is determined by the concentration levels of activities and jobs and the saturation of the road system in certain places and times (GUSMÃO *et al.,* 2010).

In general, it appears that in many locations there is no appropriate place to the loading/unloading operation.

According to Allen *et al*. (2000 *apud* Sanches Junior, 2008), trucks usually use curbs, double-park, block the road and consequently cause traffic congestion. In other situations, the logistics operation may suffer financially, because freight vehicles will circulate seeking a

vacant parking space, or because companies' parking areas or their loading/unloading areas are far from the place of delivery of goods, or even because one must return at a different time or day to carry out the operation.

As the authors point out, it is desirable to establish guidelines for reducing the social and environmental impacts caused by operating of freight vehicles in urban centers, by changing some characteristics of these vehicles' activities in urban areas.

According to Oliveira *et al*., 2012, it is essential to develop a system of distribution of goods that meets the needs of the present without compromising the needs of future generations, involving decisions in a variable geographical scale (local, regional, national and international and global), with their economic, environmental and social impacts.

Chart 1 shows the types of impacts and the problems generated by the distribution of goods.

Chart 1: Types of impacts and problems caused by urban freight distribution

Type of Impact	Problem Caused
Economic Impacts	Congestion; Inefficient transportation; Resource waste.
Environmental Impacts	Emission of pollutants; Use of non-renewable fuels; Improper disposal of products such as tires, oil and other materials; Destruction of plant and animal species' habitat.
Social Impacts	Physical consequences of the emission of pollutants on public health; Damage and deaths resulting from accidents; Noise; Visual pollution; Dificulty in circulating by car or public transportation; Other related issues.

Source: Taniguchi et al. (2001 apud Oliveira et al., 2012).

According to Allen *et al.* (2000 *apud* Oliveira *et al.,* 2012), in order to make urban freight transportation more sustainable, it is necessary to set the problems and possible solutions, examine which aspects of the operation need to be modified to reduce environmental impacts and consider the economic and social impacts of the necessary changes, analyzing the conflicts between environmental and economic objectives.

Dutra (2004) emphasizes that, because physical space in urban areas has been growing and has been increasingly used by road freight transportation, and because of its impacts, noted over the last decade of the twentieth century, there is an urgent need to use the concepts of

city logistics methodology, developed in the late 90s in Europe as a new area of transportation planning. It is able to strike a balance between the desired efficiency by urban freight transportation and the social costs involved (consequences of traffic congestion, impacts on quality of life and environmental quality and energy conservation, among others).

THE CITY LOGISTICS METHODOLOGY

According to Oliveira *et al. (*2012), currently there is an urbanization trend in the world. Cities seek to attract more opportunities with activities such as jobs, education, culture, sports, among others. The authors emphasize that the concentration of people in urban areas is observed through the development and industrialization of cities. However, this leads to the expansion of urban areas and hence problems in freight transportation, due to a lack of appropriate policies for city logistics.

According to Oliveira (2007) efficiency and a favorable environment to the logistics system help cities become more competitive in terms of economic development. Thus, developing policies based on the City logistics trend is an alternative to improve efficiency in the urban distribution system. The studies involving this new trend started in the 90s in some European cities, mainly in Germany, Belgium, Denmark, the Netherlands and Switzerland, through pilot projects related to alternative models for distribution in urban centers.

So at the end of the 90s, there was the urgent need for initiatives in City logistics through a new area of transportation planning that would strike a balance between the efficiency required by urban distribution and the social costs involved, and which would use new technologies and technological applications and would encourage the search for different ways to perform the activity in urban centers (OLIVEIRA *et. al*., 2012).

Defining City logistics

Taniguchi *et al.* (2001) define City logistics as a process of overall optimization of logistics activities, performed by entities (either public or private ones) in urban areas, considering such factors as traffic, traffic congestion and energy consumption in the structure of the economic market.

Therefore, City logistics aims to reduce diseconomies in order to make the entire system more effective through innovative solutions that reduce the logistical problems generated by distribution in urban areas and improving quality of life (OLIVEIRA, 2007).

For Muñuzuri *et al.* (2005), City logistics is the term used to denote specific logistics concepts and practices involved in urban distribution in congested urban areas, with their specific problems, such as delays caused by traffic congestion, unsuitable places for parking, among others.

According to Crainic *et al.* (2009), City logistics is a concept that surrounds the field of ideas, studies, policies, models and methods that allow to achieve the following objectives:

1. Reduce traffic congestion and increase mobility by controlling the number and size of freight vehicles operating in urban centers, reducing the amount of "empty" drives and improving the efficiency of freight handling;
2. Reduce pollution and noise levels, helping to achieve the objectives set by the Kyoto protocol and improving the quality of life for local residents.

Taniguchi *et al.* (2003) present a conceptual framework for City logistics which is based on three pillars: sustainability, mobility and quality of life – all of them related to values such as global competitiveness, efficiency, environmental friendliness, reduced congestion, safety, reliability, energy conservation and labor force. Figure 2 illustrates this view.

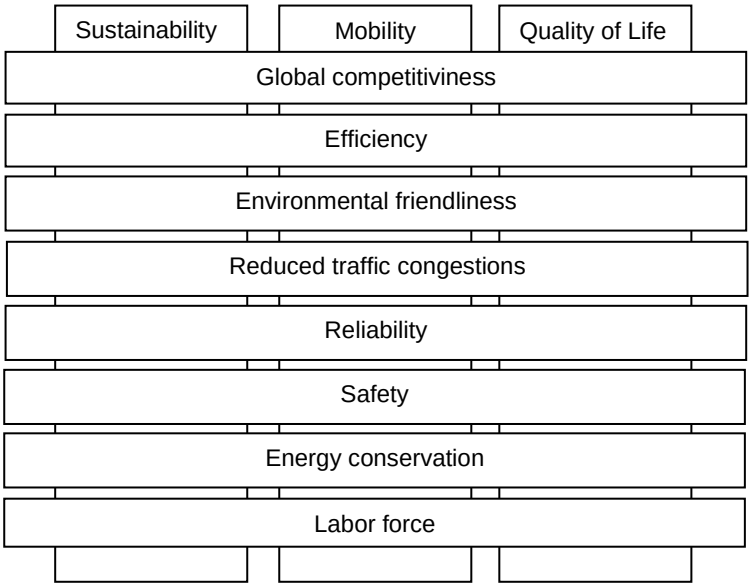

Figure 2: Pillars of City logistics
Source: Taniguchi *et al.* (2003).

Sustainability focuses on minimizing environmental impacts and energy consumption. Mobility meets the basic requirements for the transportation of goods, whereas quality of life meets the requirements for road safety and better environment for the community.

Thus, according to Taniguchi *et al.* (2007), City logistics schemes include one or more of the following alternatives:

1. Advanced information systems and cooperative systems of freight transportation;
2. Public logistics terminals;
3. Sharing freight vehicles;
4. Underground freight transportation systems;
5. Controlling access to urban areas.

Modeling in City logistics

Oliveira *et al. (*2012) believe that, in order to forecast the impacts of city logistics initiatives so as to evaluate proposals, mathematical modeling is desirable. The authors also state that the models can describe the behavior of the individuals involved in urban freight transportation, incorporating movement and transportation of goods. Moreover, models also need to quantify the changes in logistical activities' costs, traffic congestion, noise and environmental pollution, after implementing the initiatives in city logistics.

Also according to these authors, the current models offer a simplified view of the urban freight system. Therefore, techniques that provide quantitative estimates of costs and benefits of city logistics projects are necessary.

According to Taniguchi *et al.* (2001) modeling in city logistics is a challenging practice, since there are several complex logistics activities for each of the agents involved in the process. Modeling the transportation network is another important component of the models in this field because it considers freight vehicles and passenger vehicles, focusing on the impacts generated by freight vehicles.

According to these authors, there are three types of network models that can produce information and can be used in the proposed estimation:

1. Demand: goods and vehicles;
2. Offer: travel time and reliability;
3. Impacts: environmental, economic, energy consumption, social and financial.

For Dutra (2004), there are several kinds of tools and city logistics organization techniques which can be applied to specific local conditions. According to Dutra (2004 *apud* Oliveira *et al. (*2012), key processes in the development of a conceptual city logistics planning are:

1. Economic analysis and trends in logistics, current practices in urban distribution of goods;
2. Identification of participants (local authorities, logistics service providers, employers, industrial and commercial companies, local residents), harmonizing the different views and possible conflicts with the implementation of the measures;
3. Development of a methodology for obtaining information on the flows of goods in the city;
4. Organizing data collection and identification of the flow of goods to loading sites, routes, time periods, frequencies, volumes, among others;
5. Identification of potential bottlenecks in the supply chain caused primarily by the lack of infrastructure and coordination in the logistical planning;
6. Development of a proposal to remove bottlenecks and improve the effectiveness of the logistics system;
7. Dissemination of project results among interest groups.

For Russo and Comi (2004 *apud* Oliveira e*t al.,* 2012), studies involving urban distribution have increased, especially in Europe and Japan, and in order to manage and control the urban distribution of goods it is very important to have models and tools to simulate the system. The authors also emphasize that the urban distribution system must find solutions that reconcile the conflicting goals between trade-offs: to ensure an efficient distribution system that meets the needs of demand with minimal environmental impacts.

Allen *et al.* (2003) point out that the private sector needs to forecast demand for transportation services in order to anticipate future financial commitments, equipment acquisition and to order labor force. The public sector needs to predict the future needs of transportation for people and goods in order to provide infrastructure and human resources that make mobility possible.

Thus, the main difficulty in analyzing urban mobility is to identify the decision makers of the process, that is, those who choose the characteristics of the trip and are responsible for the production, distribution and marketing, operating in different fields of production (RUSSO and COMI, 2002 *apud* OLIVEIRA *et al.,* 2012).

REDUCTION OF THE NEGATIVE EFFECTS OF THE IMPACT OF TRAVEL TIME OF ROAD FREIGHT TRANSPORTATION

Among the freight logistics solutions proposed by Muñuzuri *et al*. (2005) there are specific ones related to the presence of freight vehicles and traffic management, which fight the problem of traffic congestion caused by urban freight logistics. Thus, Charts 2 and 3 present the proposal to reduce the negative effects of the impact correlated with the proposed solutions.

Chart 2: Reduction of the negative effects of the impact and freight logistics solutions to presence of freight vehicles

Solution	Definition	Reduction of the negative effects of the impact
Access according to size and weight	Determining the type of vehicle allowed to acess a certain area. The criterion used is, in most cases, the vehicle weight, but there are also those who use the size.	The changes of characteristics of the road system and its geometry, which usually leads to constant maintenance and repair and interference in the ways of the road system.
Provision for freight areas	It is the regulation in the construction of buildings that should be concerned with the provision of internal areas for loading and unloading.	It would avoid inappropriate use of the road system during daytime hours to load/unload goods, avoiding undue traffic congestion during the day.
Provision for parking	This solution aims at reducing the number of parking spaces in certain urban areas, eliminating public parking without constructing new parking lots. It is a solution applicable to congested areas and in cities interested in reducing air pollution.	Reduction of loading and unloading areas without interfering too much in the road system and the consequent reduction of pollution levels.

Source: Created by the author.

Chart 3: Reduction of the negative effects of the impact and freight logistics solutions to traffic management

Overnight delivery	Delivering goods overnight can be a smart way to spare the city at peak hours. The greatest opposition to this type of delivery is made by local residents because of noise.	Decreased emissions of pollutants and levels of vibration and noise on the road system, simplifying maintenance and reducing traffic congestion, improving urban mobility.
Access gaps	Setting schedules for freight vehicles in urban centers is an alternative to diversify traffic and to avoid conflict of interests. Freight vehicles use the morning schedule and part of the afternoon, their transit being forbidden outside these hours.	Implementing zones of maximum vehicle restriction, which allows for lighter traffic during the day on the road system, enabling better transit for people and increasing urban mobility.
Classifying freight zones	As different kinds of goods require different types of delivery, the various areas of the city also have their peculiarities with regard to the type of goods that are common there. Classifying freight zones in the city helps manage different policies for each area according to the local economy.	Decreased loading/unloading areas in the city, benefiting delivery and distribution of goods and reducing the traffic congestion on the cities' road systems.

Source: Created by the author

According to Charts 2 and 3, freight logistics solutions for freight vehicles and traffic management are supported by responses as to reducing the negative effects of the impact of travel time of road freight transportation in urban centers. Therefore, it is possible to establish guidelines, within the proposed conceptual framework, which will adequately meet the condition of the problem.

Proposed Model for Reducing the Negative Effects

Besides the information in Charts 2 and 3, the proposed model takes into account urban freight logistics solutions (MUÑUZURI *et al*., 2005), the concepts and definitions on city logistics (TANIGUCHI *et al*., 2001, 2003, 2007 and TANIGUCHI, 2011), field research conducted among transport experts on ANPET (2011), and observations conducted while presenting the activities of implementation of the City Logistics Brazilian Club. The proposed model has the configuration shown in Figure 3.

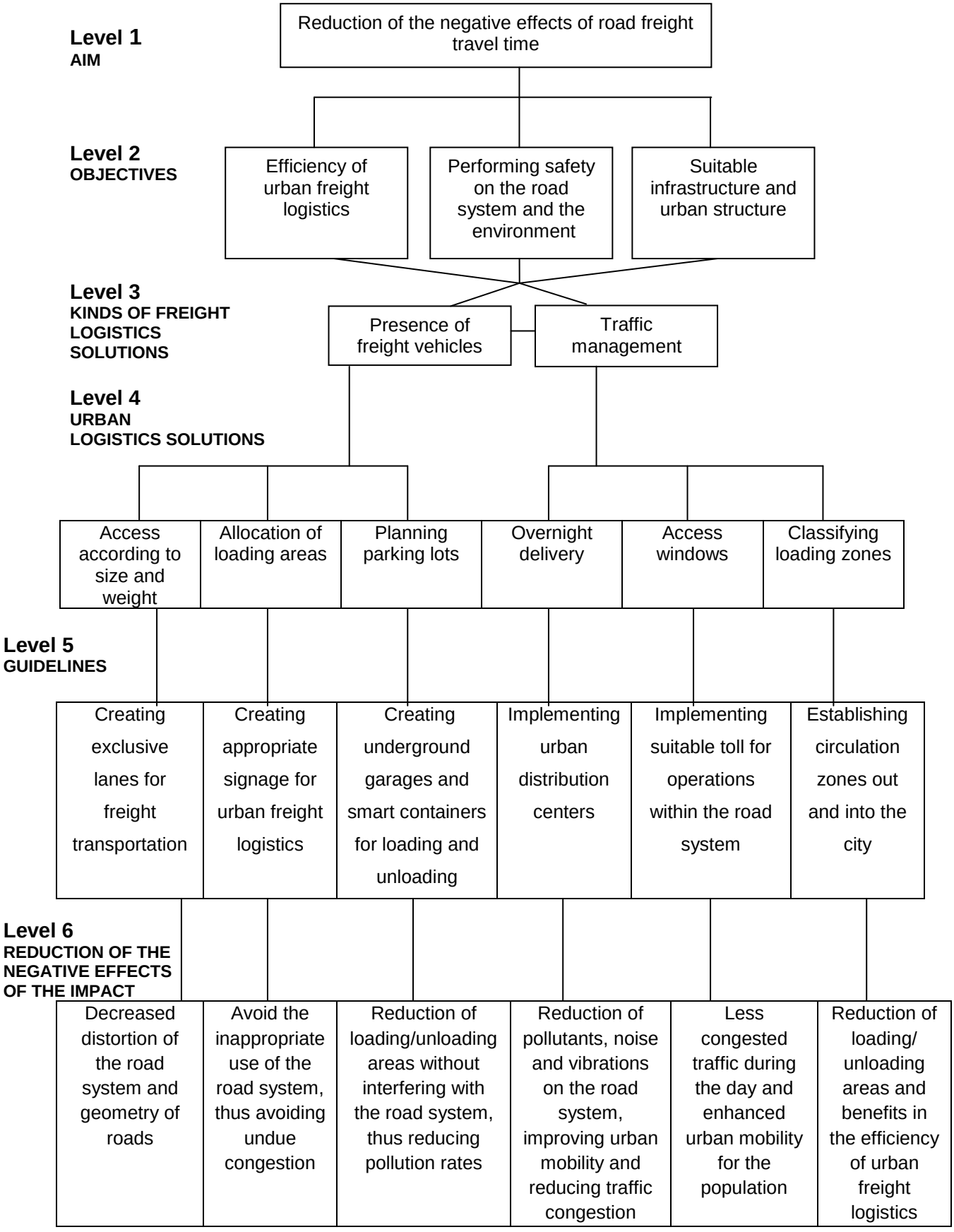

Figure 3: Conceptual model for reducing the negative effects of urban freight distribution
Source: Created by the Author.

Figure 3 presents a conceptual model containing guidelines that aim to enable the reduction of negative effects of travel time of freight transport in urban freight distribution in urban centers of the cities. This model is based on the solutions proposed by Muñuzuri *et al.* (2005), which are specifically shown in Charts 2 and 3 above, focusing on the presence of freight vehicles and traffic management. These solutions are related to traffic congestion, caused by freight transportation travel time, when they travel along with other passenger vehicles on the road system.

In addition to the guidelines, the mentioned model also seeks to show the potential reduction of the negative effects of travel time, which may be related to each of the proposed guidelines. Although there may be other ways of reducing the negative effects, this model seeks to establish the ones believed to be the most appropriate response to each of the guidelines presented.

So with this new conceptual proposition, the model is expected to be a suitable one so that the negative effects of the impact of road freight transportation in urban centers can be effectively reduced, as presented in Charts 2 and 3 above.

Therefore, the author believes that, with the specific guidelines proposed, urban freight distribution may have better performance in urban centers, once these guidelines seek to establish the procedures to be adopted, which will lead to a reduction of the negative effects on urban freight logistics operations.

CONCLUSIONS

In recent years, urban freight distribution has gained crucial importance regarding the problems associated with city growth and development. Solutions are being sought to reduce the constant traffic congestion and greenhouse gas emission, to improve the population's quality of life, among other factors, seeking to provide a more appropriate and fairer life for the various societies worldwide. These solutions aim to take the product to the final consumer in the shortest time possible, besides trying to meet their needs, seeking to reduce the negative effects of the impacts. Therefore, the solutions already proposed and implemented have not yet achieved the desired success, mainly due to the lack of integration of the elements involved, and who were initially committed to the presented logistical scheme.

It is desirable that the solutions presented – along with the proposed guidelines aimed at reducing the negative effects of urban freight distribution in cities – be considered by all those involved in the process, attempting to remedy all conflicting goals, pursuing continuous improvement in the development of cities. Thus, with the knowledge and dissemination of City logistics practices, the negative effects of the distribution of goods in cities could be minimized.

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