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Economical and environmental analysis of an urban consolidation center for Belo Horizonte city (Brazil)

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Abstract

The urban freight transportation is a fundamental factor to the development of big cities with a significant importance in the support of people stay of life, besides it plays a role in the maintenance and conservation of industrial and commercial activities and it contributes to industrial competitiveness. However, it impacts the products cost, the regional economic efficiency and the environment as energy consume, pollutant emission, noise and visual intrusion. Starting from a brief review about UCC, it was developed a methodology to analyze the economical and environmental impacts of an urban consolidation center (UCC) that was applied on the Belo Horizonte city (Brazil). The results show a substantial reduction of number of vehicles at congestion area and a decreasing of pollutant emission in the urban environment.

Keywords: Urban distribution; urban consolidation center; economical and environmental impacts

1. Introduction

The intensity that the urbanization process has been happening in Brazil in the last 60 years has generated a growing concern about the future of the Brazilian cities, since their growth is occurring without a systematic control and it can be disastrous. The lack of an urban planning causes many problems, that when established, they are practically unchanged or imply in high cost to be eliminated (Silva, 2004 and Carrara, 2007).

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Browne *et al.* (2007) pointed out that in the last years a great deal of researches has been realized in relation to traffic levels and its impacts on big cities. These studies focus, essentially, on analysis of public transport and private vehicles with few efforts in relation to urban goods transport although it represents between 20% and 30% of the total number of vehicles and 16% to 50% of all air pollutants in major European cities (LET-aria, 2006 apud Dablanc, 2007). Crainic *et al.* (2004) explain that the already significant volume of cargo vehicles moving within the cities limits is increasing and will continue to grow at a rapid pace. The main factors contributing to this phenomenon are the current production and distribution based on low inventories and Just in Time deliveries and the explosive growth of electronic commerce that generate huge volumes of home deliveries.

The public authorities promote few policies in relation to goods transport in big cities, acting, mainly, towards the regulation of parking, access road and time window for the loading/unloading operations (Crainic *et al.*, 2004). According to the authors, this fact occurs because the government considers the cargo transport as an activity, essentially, private. So, the goods transport issues in the city level is still not well understood or quantified, and there is a lack of methodologies directed to analyzing or planning its movement.

Crainic *et al.* (2004) however relate that this scenario tends to change because the number of vehicles of all types is increasing rapidly and, as consequence, the congestion and the pollutants levels grow at a rapid pace. Therefore, there is an increasing in the public awareness about these issues that impact the population life quality in big cities. The authorities also began to take notice and show an increasing political will to change the current situation. Thus, the need arises to analyze the movements of goods vehicles in cities.

The urban cargo transport is a fundamental variable to development of big cities. Browne *et al.* (2005) highlight that it has a significant importance to support population lifestyle; plays an important role to maintenance and conservation of industrial and commercial activities; contributes to industrial competitiveness; causes effects on goods costs promoting direct impact on economical efficiency of a region; besides, it brings consequences to environment such as energy consumption, pollutants, noise and visual intrusion.

Among the alternatives to mitigate the negative externalities of freight transport involving the city logistics concept, there is the urban cargo distribution center (UDC) which is described as an important factor to improve the logistic process in the cities. The UDC aims to rationalize the goods distribution according the interests congruence among many actors involved in the urban movement such as public authorities, population and all supply chain represented, mainly, by retailers, carriers and suppliers. This paper presents a methodology for assessing the economical and environmental impacts of an UDC. Primarily it will be presented the UDC concept and how it can be used to improve the logistics process and to mitigate the negatives externalities of urban distribution. Then, it will be depicted the model developed in this paper, ending with the presentation of the results from the application of the model in Belo Horizonte city (Brazil) and conclusions as well.

The cargo consolidation of different shippers and carriers in the same vehicle associate with a operational coordination in the cities is seen as one of the most important manner to mitigate the negative externalities caused by freight transportation in urban centers (Benjelloun and Crainic, 2009; Crainic *et al.*, 2009; Browne *et. al.*, 2007; Nemoto *et. al.*, 2006; Browne, *et. al.*, 2005). This way, the urban distribution center (UDC) concept is considered an important instrument among urban logistics initiatives (Crainic *et. al.*, 2009). The idea that involves the UDC concept is to separate logistics activities inside and outside the city as showed in Fig. 1.