Analysis of Freight Trip Generation Model for Food and Drinks in Belo Horizonte (Brazil)

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Extended abstract

Objectives and motivation

Today, one of the main challenges faced in urban logistics is the distribution of goods. In Brazil, mid to large cities have suffered consequences of unplanned urban sprawl and lack of adequate transportation infrastructure. If in one hand a high percentage of the population live in urban areas (83.4% in Brazil), on the other hand the lack of an efficient planning, transportation policies and monitoring the use of urban space aggravates this scenario. As a fact, the growth of individual transport -in the last decade the use automobile increased by about 8% a year, and the motorcycle 15% per year, over the use of public transport which fell 30% in the same period (DENATRAN, 2015)- maximizes the traffic and the competition for parking spaces, which is vital for delivering goods efficiently downtown.

According Portugal (2012), the city is an organism in constant transformation and due to the changes in the urban environment, the impacts on transport activities are evident. Thus, the relationship between urban planning and transport stands out the attractiveness of some urban activities with direct impacts on the movement of people and goods and other component elements of urban space. The segment of bars and restaurants falls within this context. This is a vital activity responsible for significant percentage jobs and revenue. Foods & drinks move daily significant volumes of goods, to meet the need of customers. This paper presents the results of a freight trip generation model for pubs and restaurants in Belo Horizonte (Brazil). After obtaining the model that determines the number of trips generated per day, the results were extrapolated to Belo Horizonte and analyzed through interpolation, with housing data, income and employment.

General description

Belo Horizonte is a planned city founded in December 12, 1897 to be the political and administrative capital of the state of Minas Gerais. Despite the city still presents streets, avenues and land planned in the downtown, since its foundation until today very little has been redesigned with respect the transportation needs. The city grew mostly towards the limits and not much investment or major changes in the road infrastructure happened in the central area. As result, a massive volume of vehicles move daily towards downtown, which infrastructure and transportation policies must be remodeled to accommodate the movement of people and goods in an efficient manner.

The study was conducted for the central region of Belo Horizonte, due to the fact the sector of pubs and restaurants are a major freight destinations (Oliveira, 2014). In addition, in the metropolitan area and Belo Horizonte there are about 12,000 establishments related to pubs and restaurants. The information about the establishments was obtained through the Municipal Taxpayers (CMC) provided by the Municipality of Belo Horizonte. In the CMC records we identified 4,360 establishments such as pubs, restaurants or similar in Belo Horizonte. The data for the freight trip generation model were obtained by survey. For this, we designed a structured questionnaire to obtain information about goods, frequency, operationnal time, place of performance of the loading/unloading of goods, establishment size and the number of employees. Besides this information, we investigated the acceptance of alternative practices in the delivery of goods, like off-peak delivery.

To obtain the proposed models, we applied a simple linear regression, correlating the following variables: (i) Number of trips versus area of the establishment; (ii) Number of trips versus number of employees; (iii) Number of trips versus operation day of the establishment. With the results of the linear regression for travel generations, conducted the data interpolation based on the standard deviation of the results to define the sample classification bands. This interpolation method was chosen because it is one of the most suitable for analysis of spatially scattered points, given the straightforwardness of the model and does not consider extra noise such as slope and spatial constraints as barriers. In this method, interpolation is determined by the value assigned to each point (in this case the number of trips), wherein a point closer to the other higher correlation trend. Finally, the results were analyzed with the socio-economic data of the city of Belo Horizonte.

Results and conclusions

Three hundred establishments were interviewed in different neighborhoods of Belo Horizonte, and the sampling error was 5.4%. The establishments surveyed have from 45-400 square meters and employ from 1-30 employees, depending on the size of the establishment. The frequency of goods delivering is between 5-6 times a week in 66% of in establishments, and fresh products such as meat are delivery daily. The delivery of drinks occurs 3-4 times a week in 49% of the establishments, and does not have a set time for operation. Other than drinks, 71% of the deliveries happen between 08:00 am and 10 am. On average, each establishment receives 1.2 deliveries/day.
Findings of this study indicate the need for planning of urban goods distribution and land use. The high concentration of pubs and restaurants in the same region reinforce the vocation of the city for trade. However, this brings problems such as the high number of freight vehicles in the urban area to meet a high and growing demand. This study also highlights the need for urban freight mobility plan to minimize the problems of this activity, improve the urban environment and invest in sustainable alternatives for urban goods distribution. Using surveying and geospatial analysis, the study output statistics and maps to either catch attention of decision makers and promote discussions on transportation policies in the city of Belo Horizonte.

References

Keywords: urban goods distribution; freight trip generation; pubs and restaurants; diagnosis; Brazil.