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Urban freight-parking practices: The cases of Gothenburg (Sweden) and Delhi (India)

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ABSTRACT

The paper provides insight into a comparison of the parking practices and problems of freight-vehicle drivers in Gothenburg, Sweden, and Delhi, India. The purpose of this study is to understand how parking problems are related to relevant characteristics of the study zones, e.g., geographical location, transport mode used for last-mile deliveries, and type of industry sectors attracting freight traffic. The study also examines the possible impacts of imbalance between parking demand and supply. The methodology involves the estimation of freight-parking demand using establishment-based surveys and cordon counts; parking practices and problems are captured through freight-vehicle drivers' semi-structured interviews, and parking space supply is obtained from a parking inventory. Based on the analyses and findings from the study, the authors propose a set of recommendations to enhance parking management for freight vehicles in each area.

1. Introduction

The traffic impact of city logistics has received growing interest in the past few years. On one hand, the circumstances are such that, due to an increase in population density, the consumption of goods and services has increased. On the other hand, environmentalists and transport engineers are expressing their concerns about growing urban freight problems, such as traffic congestion, safety, greenhouse emissions, increasing noise levels, etc. Various measures including access restrictions, time restrictions, environmental zones, provision of urban consolidation centers, and the introduction of new vehicle technology have been adopted in different parts of the world to improve the efficiency of freight operations (ASCE, 1989; BESTUFS, 2007; City Ports, 2005; Muñuzuri, Larrañeta, Onieva, & Cortés, 2005; Russo & Comi, 2011; SUGAR, 2011). Among them are measures related to the provision of parking arrangements for freight vehicles.

Parking policies are considered to be one of the powerful measures to manage travel demand patterns and reallocation of trips in urban areas (Alho & e Silva, 2014; Chaniotakis & Pel, 2015 and Nourinejad, Wenneman, Habib, & Roorda, 2014). Allen et al. (2000) identify the improvements in the availability of on-street parking facilities and better enforcement of parking regulations among good initiatives to foster easy and efficient performance of urban distribution activities.

Parking has been identified as a key challenge for freight distribution and service activities in urban environments. Morris and Kornhauser (2000) argue that despite major advancements in urban goods movement and distribution activities, the management of supply chain ceases at the point of delivery of products from trucks to establishments. Through proper management of parking infrastructure, the delivery time and associated costs can be decreased, thus leading to increase in the productivity of the region. Searching for on-street parking space has been associated with economic and environmental impacts through the disruption of the network flow, increase in pollution levels, time delays to other vehicles and other potential safety hazards due to vehicle maneuvering (Brooke, Ison, & Quddus, 2014). Alho and e Silva (2014) through the reference of European and Japanese studies confirm the involvement of 50 to 86% of illegal parking by freight vehicles in conditions prone to triggering traffic disruption. The authors use an aggregate indicator of "level of service" (number of establishment served by loading bays within a threshold walking distance) to explore freight parking supply deficit in the highly concentrated commercial areas. The authors stress on re-planning the location and the number of the loading and unloading bays, strengthening the enforcement of parking regulations for the optimisation of the scarce space.

Despite the importance of parking in urban-freight transport, the phenomenon is not extensively elaborated on in the literature. Significant research has been conducted in developing car parking

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models with a little attention on the impact of parking infrastructure and policies on freight distribution activities. Jaller, Holguín-Veras, and Hodge (2013) highlight the relative success of parking restrictions for shifting passenger traffic to other modes, as compared to the inefficiency of these restrictions to decrease freight traffic at the urban level. The reason is that urban freight distribution requires a flexibility and accessibility that only road modes can provide. Different freight initiatives, such as urban consolidation centers and off-peak deliveries, may reduce congestion and the number of freight trips, but the road remains the dominant mode because of the structure of urban areas and its cost efficiency in delivering goods.

Given the importance of parking infrastructure in freight distribution activities, the purpose of this paper is to identify parking problems of freight vehicles in urban environments with a high concentration of commercial activities. A comparison is drawn between two cities, Gothenburg in Sweden and Delhi in India, in order to understand how parking problems for freight vehicles are related to different characteristics of the study zones, e.g., geographical location, transport mode used for last-mile deliveries, and industry sectors attracting freight traffic. The study compares and analyses current parking practices of urban-freight vehicles in both cities and freight-vehicle drivers' opinions about parking availability, and it explores the impacts of inefficient allocation of parking spaces on fuel consumption and emissions. Based on the analyses and findings, a set of recommendations is proposed to improve freight-parking problems.

Gothenburg city is chosen to represent the case of a relatively homogeneous mix of an urban environment with an organized and advanced structure for urban-freight distribution. Delhi, on the other hand, represents a case of heterogeneous land use system with different activities (residential, commercial, industrial) co-existing. No explicit spatial arrangement of these activities in the city can be distinguished and this is reflected through the heterogeneity in the street space usage. This heterogeneity can also be observed in terms of the modes used for freight distribution (cycle rickshaws, three-wheelers, motorbikes, small, medium and large size trucks). In addition to this, Delhi's transportation policies have always been passenger cars centric with little concern to include freight transport at city level planning. Instead, freight policies in Delhi have been prohibitive in nature with no clear cut plans to improve the efficient movement of goods in the city. As opposed to Delhi, Gothenburg's freight policies are rather inclusive in nature and aim to bring different stakeholders to solve the problem of freight distribution in the city. The dissimilarities observed for the two case studies present both an interesting opportunity and important challenge for comparisons.

The selection of the case studies from two very different settings aims to show that parking is a common problem in urban-freight distribution. Although both cities have different socioeconomic and historical backgrounds, and very different urban logistics technologies and practices, freight-vehicle drivers share a common challenge for urban-freight distribution: finding the best parking space. The outcome of the in-depth analysis of parking problems for two different urban environments will help to formulate better freight-parking policies in both cities, and could also serve as input for other cities facing freight parking challenges. In addition to this, the analysis of these case studies will allow to identify key factors explaining freight vehicles' illegal parking and provide insight on how to avoid it through better parking management initiatives.

The paper is divided into five sections: (i) Literature review; (ii) Methodology and data collection; (iii) Results; (iv) Discussion of results and findings; and (v) Conclusions.

2. Literature review

The literature review has been divided into five sections: urban freight-parking studies, freight parking-demand models in comparison to passenger-car parking-demand models, existing urban freight-parking policies, and a summary of the literature review.

2.1. Urban freight-parking studies

Various studies have identified parking as a major issue for urban-freight distribution. The ASCE (1989) considers parking trucks to be one of the major concerns of urban-goods development. ASCE (1989) highlights that the public is much more concerned with passenger-car parking, although the costs of delays in goods deliveries and loss of time borne by consumers is quite high. Three major problems have been identified in central business districts: i) a lack of off-street and on-street parking; ii) the illegal use of loading zones; and iii) time restrictions. The controversy about whether or not to allow service vehicles to use loading/unloading bays is also raised. Anderson, Allen, and Browne (2005) discuss how the implementation of freight strategies like low-emission zones, weight restrictions, time restrictions and congestion charging impact the distribution patterns of various companies. The problem of queuing at the receivers' side is highlighted due to time-restriction policies. Freight trips are concentrated in brief time frames, leading to overcrowding in urban areas. Another study by Swamy and Baindur (2014) highlights that the lack of parking space has resulted in the spillover of freight activities onto roads, in turn obstructing the flow of traffic in the city of Ahmedabad in India. The non-availability of parking space has also resulted in theft incidents. Manzano dos Santos and Sánchez-Díaz (2016) present the results of an attitudinal study in Brasilia (Brazil) where all the carrier managers interviewed identified parking as a key problem for urban-freight distribution, followed by congestion and long delivery times. Han, Chin, Franzese, and Hwang (2005) estimate the losses incurred due to illegal parking of pickup and delivery activities. The authors find that pickup and delivery activities rank third in causing motorist delays, among other delay-causing factors. A loss of approximately 500 million vehicle hours has been calculated. Kawamura, Sriraj, Surat, and Menninger (2014) perform regression analysis to understand the relationship of truck citation data and three variables: the economic activity of the area, the socioeconomic characteristics of the residents, and the built environment. The study stresses the inclusion of delivery vehicles in land-use planning and urban street-design processes.

Pivo, Carlson, Kitchen, and Billen (2002) interviewed freight drivers to identify their views on the planning and design of urban parking centers. The interview included questions and observations of freight drivers concerning “curb space and alleys”, “pedestrian interaction”, “building entrances”, “loading docks and signage”, “zoning and design”, and “technology and equipment”. The issues of loading zones used by cars with commercial plates, inappropriate loading and unloading zone lengths, and garbage dumpsters adjoining loading bays are highlighted. Another study by Dezi, Dondi, and Sangiorgi (2010) discusses strategies for optimising the size, number, and location of loading and unloading bays. For the size of a loading zone, the size of the freight vehicles serving the zone must be known. The number of loading and unloading zones is decided based on commodity flow and the area served. Lastly, the location of loading and unloading bays should be planned to serve the maximum number of establishments and to minimize the travel path. Furthermore, Cherrett et al. (2012) observe the number of freight and service trips in peak vs. non-peak periods, the dominant mode used to make the deliveries, and mean dwell time. Also, the authors find service trips to be quite significant in freight movements and thus suggest nearby parking spaces for service-freight activities. Jaller et al. (2013) highlight New York City's freight-parking problems, provide insight into how parking demand and supply can be calculated, and comment on possible parking-management policies. The authors use freight-trip generation models to estimate parking demand for freight and the available curb space to estimate parking supply. The analysis is made with the assumption that all the curb spaces are used by trucks.