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Location of freight consolidation centres serving the city and its surroundings

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Abstract

This paper investigates small road hauliers' spatial location and road network accessibility in relation to proposed freight consolidation centres (FCCs). For many decades, the overall load factor in freight vehicles has decreased; smaller volumes of goods have been transported over longer distances. To counteract this, a well-planned localisation of FCCs has been suggested as a measure to improve transport efficiency. Based on 3,024 road hauliers, road haulier associations, freight forwarders, and delivery firms/couriers located in the Western part of Sweden, the analysis show a high concentration of small road hauliers towards the largest city, its immediate surroundings, and towards existing facilities of large freight forwarders and road haulier associations. Furthermore, the accessibility analysis shows that a very large majority of the small road hauliers as well as large forwarders and haulier associations are reached within a short time distance from the proposed FCCs, indicating the potential to establish FCCs serving small road hauliers. While it is not possible to conclude that the 'proposed' FCCs are optimally located, the paper provides a basis to further investigate the most appropriate locations of FCCs serving the city and its surroundings, and whether and under what conditions FCC establishments are viable.

Keywords: Freight consolidation centres (FCCs); small road hauliers; spatial location; network accessibility; optimal location

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1. Introduction

This study takes as its point of departure the fact that roads and cities are increasingly saturated by freight vehicles carrying low average loads. For many decades, smaller and smaller volumes of goods have been transported across longer and longer distances in an even larger number of vehicles, whose overall load factor is decreasing (Friedman, 1975; Browne *et al.*, 2007a and b; de Magalhães, 2010). This development influences firms and society at large, since capacity that could have been used more productively is lost. To counteract this trend, freight consolidation centres (FCCs), wherein small loads are consolidated before being delivered to their final destinations in large-size vehicles with high load factors, have once again received attention as a measure to curb freight transport-related externalities through a more efficient usage of transport resources. A more thoroughly and well-planned localisation of urban consolidation nodes (and intermodal logistics centres) has been highlighted as a central aspect and measure to improve the efficiency in city distribution (Ljungberg and Gebresenbet, 2004; Browne *et al.*, 2007a; BESTUFS, 2007; Chwesiuk *et al.*, 2010; Kayikci, 2010). Notwithstanding the attention given to the issue, our spatial knowledge of the location of freight transport intensive activities, which is considered to be one of the most complex decision-making problems facing transport analysts (Kayikci, 2010), is often rudimentary, making it difficult to ascertain the most appropriate location for the FCCs.

Research on FCCs has, on the one hand, neglected to study their location in relation to road hauliers, road haulier associations, freight forwarders, distribution zones, and warehouses, and, on the other hand, focused on sub-optimisations with micro terminals serving a limited geographical area, number of shippers and transport operators (Benjelloun and Crainic, 2009; van Duin *et al.*, 2010; Patier and Browne, 2010). Furthermore, analysts often overlook the situation of small road hauliers, as well as the volumes that these operators do not transport through forwarders and road haulier associations, despite the fact that they make up a large majority of all road hauliers, especially in urban freight (Löffler, 1997; Deblanc and Rodrigue 2010). The consolidation project in Nijmegen, Netherlands as explored by van Rooijen and Quak (2010), is a good exception but the gap in the literature remains an opportunity for research that applies a spatial perspective to all road hauliers. The small road hauliers lack the scale and supporting tools for well organised operations, as found in Bologna by Dezi *et al.* (2010).

The focus in this study is accordingly on small hauliers having inferior preconditions for efficient transport services compared to large road hauliers, forwarders and the logistics arms of retail chains. Finally, while long distance transports have been heavily studied, the 'last mile problem' and transport in the urban periphery has received less attention, often due to a lack of data, despite the fact that the largest percentage of freight transport by road occurs in these areas (Hesse, 1995; Löffler, 1999; Behrends *et al.*, 2008, van de Riet *et al.* 2008; Chwesiuk *et al.*, 2010; Patier and Browne, 2010). This motivates a wider spatial perspective.

Through an initial analysis of small road hauliers (0–9 employees) spatial location and network accessibility analysis, measuring transport time from two potential FCC locations, this study provides a basis from which to further investigate appropriate locations for FCCs that serve the city and its surroundings, and whether and under which conditions FCC establishments are viable in terms of sufficient volumes and participating hauliers, freight type, accompanying measures, operation, users, etc. In the analysis, the facilities of the road hauliers, road haulier associations, and forwarders make up the nodes, while roads make up the links. The study is located in the county of Västra Götaland (henceforth VG) in Sweden, focusing on the City of Gothenburg (including Mölndal municipality) (henceforth the CoG) (Fig. 1). By including a larger geographical area, this paper avoids focusing on a specific zone. Furthermore, instead of focusing on final delivery destinations, the study begins at the operators' geographical location, starting with the place of departure for distribution vehicles. The second section provides a theoretical discussion, while the third section outlines the methods and materials used, and a