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Urban traffic congestion and freight transport: A comparative assessment of three European cities

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Abstract. A high proportion of freight and service transport in cities takes place during peak hours on the road network. At the same time, trends in supply chains and logistics management together with changes in the behaviour by business and private consumers are leading to increased fragmentation of last mile deliveries. The combined result of this is that more vehicles are trying to make more deliveries at the same time and the infrastructure available (roadspace and curbside space) cannot cope. The paper explores this trend by means of a review in three contrasting cities: Stockholm, Brussels and London. The research is a qualitative assessment of trends and developments focused on freight transport and congestion. The three cities suffer from problems of congestion and all have a growing number of smaller vehicles being used in urban supply chains. This has consequences for congestion patterns. All three cities also face greater increases in freight transport activity compared with personal car travel. The scope to retime deliveries to the off peak hours (OHD) is important and some progress has been made although it is limited. The comparisons provide some insights and give ideas for further changes.

1 Introduction

A high proportion of freight and service transport in cities takes place during peak hours on the road network. At the same time, trends in supply chains and logistics management together with changes in the behavior by business and private consumers result increased fragmentation of last mile deliveries. The combined effect is that more vehicles are trying to make more deliveries at the same time and the infrastructure available (roadspace and curbside space) is inadequate for the demand. The paper considers these issues in three contrasting cities: Stockholm, Brussels and London.

The paper is organized as follows. The next section discusses each city in turn and summarising some important trends about travel patterns, freight transport and congestion. There is also a short comment on off peak hours delivery (OHD) in each city. This is important because the use of the peak period by freight traffic presents major challenges for traffic and transport planners. Section 3 of the paper discusses similarities and contrasts between the cities and this is followed by a short conclusion.

2 The three cities

2.1 Stockholm

Stockholm (the county) has a population of about 2.2 million, which is increasing by 35-40,000 every year [1]. The City of Stockholm is the largest municipality in the county and has almost 1 million inhabitants. As part of its Vision 2030, Stockholm adopted an Urban Mobility Strategy to ensure accessibility and mobility for the city's increasing population and the freight generated. This Strategy recognizes the importance of freight and includes The Stockholm Freight Plan 2014-2017 which formulates a set of goals and action areas to enable safer, cleaner and more efficient freight deliveries [2].

Congestion pricing was introduced in Stockholm as a 6-month trial in 2006—and then reintroduced in August 2007. Prior to the congestion charge, the average number of vehicles traversing the cordon per day ranged between 380-480,000, with 18% estimated to be freight traffic [3, 4]. The short-term effect of the congestion pricing trial was a reduction by 20-22% in traffic crossing the cordon; a 20% reduction was sustained over the long term. Commercial traffic was reduced by around 15%, confirming its lower sensitivity to price. Freight vehicles adapted their distribution routes and increased the number of stops per trip.

More details on the effects of congestion charging on freight traffic after the trial are available [5]. The speed in the city centre increased, but the speed on certain freeways decreased as they became an alternative to bypass the congestion charge zone. The reduction in traffic in the inner city and the increase in roadside and curbside space availability allowed faster and more complete deliveries.

An OHD trial took place in Stockholm from 2014 to 2016. The project showed a high potential to improve the efficiency of freight distribution by delivering at night with shorter travel and delivery times and a higher overall productivity for carriers and receivers [6-10]. One of the main obstacles for a large-scale implementation of OHD is receivers' acceptance of the extra costs, or risks in the case of unassisted deliveries. The accommodation and food services sector accounts for 15% of freight deliveries in Stockholm. A study demonstrated that 20% of the receivers have a positive opinion about OHD, and 20-30% could receive during these hours [9]. Assessment of the trials revealed that OHD projects could reduce external costs by 80% compared to day-time deliveries, with congestion reductions being the main reason for savings [10].

2.2 Brussels

Car traffic is one of the biggest problems for sustainable development in the Brussels Region. Freight transport is responsible for 30% of GHG emissions from transport but is often overlooked in congestion discussions. The Federal Planning Bureau predicted a 68% increase in freight tonne-kilometres in Belgium between 2008 and 2030 (the increase in passenger-kilometres was estimated at 20%). Freight vehicles represent 14% of traffic entering and leaving the Region, a majority of which are vans, whose share is increasing while that of lorries and articulated lorries is decreasing [11].

A freight transport plan was adopted by the Region in 2013 to meet the following dual objective: (i) Improve the quality of freight transport that is mutually profitable for all professionals in the sector; and (ii) Limit the environmental and quality-of-life impacts for all road users [12]. These priorities were accompanied by quantitative targets to reduce freight sector emissions by 20% and 50% by 2020 and 2030 respectively. The plan comprises 36 actions to be implemented from 2014 to 2020 according to three axes: (i) Reduce and optimise the movements of vehicles transporting goods within and to the city; (ii) 2. Reduce the road share in favour of waterways and rail and favour environmentally-friendly vehicles for the end of the journey (last mile); (iii) Make life easier for the delivery personnel.

An OHD project has been considered in Brussels. The main obstacle is the Brussels-Capital Region government's decree of 21 November 2002 regarding noise limits. The Straightsol project tested night deliveries by two supermarket chains. The initiative was satisfactory from an environmental, economic and mobility perspective, however noise regulations within the region made it impossible to adhere to the regulatory standards [13]. Brussels Mobility and Brussels Environment, which are responsible for noise legislation, are now working on a solution.

Since 1 April 2016, a road charging scheme for heavy goods vehicles over 3.5T has been implemented in Belgium. In Brussels, it concerns all roads, whereas in Flanders and Wallonia it only applies on main roads and highways. The charge depends on: weight, roadway (highway or urban) and the EURO norm of the vehicle. The charge does not depend on the time of the day, which is a drawback as it does not encourage off-peak deliveries.

2.3 London

Motorised traffic in London has fallen since a peak in 1999 despite the increase in population [14]. Despite this change in travel behaviour there has been increased congestion. The progressive removal of 'effective capacity' for general traffic to be used to prioritise public transport, and urban realm improvements partly explains the increased congestion. Unlike car traffic, LCV traffic in London measured in vehicle kilometres continued to grow in London between 2000 and 2007, then fell during the recession (2007-2011) since when it has risen again [15]. LCV kilometres in London in 2014 were 15% higher than in 2000 while HGV kilometres in London

were 9.5% lower in 2014 than in 2000. This indicates a shift to the use of smaller vehicles in urban supply chains.

LCVs (vans) and HGVs (trucks or lorries) accounted for 13% and 4% respectively of all vehicle kilometres travelled in 2012 [16]. Informal surveys conducted by Transport for London (TfL) estimate that LCV and HGV activity accounts for 30% of the traffic entering central London in the morning peak.

Most delivery and collection activity takes place from 06:00-19:00 with only 15-20% of LGVs and HGVs entering London between 19:00 and 06:00. TfL has promoted retiming, building on initiatives developed during the Olympic Games in 2012. Guidance documents offer advice to companies on management, technical and legal issues. Guidance is also provided to local authorities (boroughs) that are responsible for local noise regulation. TfL have developed a consortium approach working together with boroughs, major retailers and industry to increase the application of retiming initiatives. Results have demonstrated improved journey time reliability and when the process is implemented and managed correctly there have been no complaints from local residents.

The congestion charge was introduced in central London in 2003. Overall freight trips by HGV and LCV did not change significantly as a result of the charge [17]. The fright sector argues that it is not able to change the time of day of most trips without the active help of receivers and a change in attitude to OHD initiatives from boroughs in central London (i.e. boroughs need to encourage off hour deliveries to provide opportunities to retime freight trips).

3 Discussion

The research presented above assesses some of the main trends and developments in the three cities focused on the issue of freight transport and congestion. The three cities suffer from problems of traffic congestion and all have introduced some form of congestion charging that has implications for freight transport. Similarities in trends are clear with a growing number of smaller vehicles being used in urban supply chains. The reasons for using more smaller vehicles is not very well understood and is a complicated mix of regulatory issues and trends towards a more fragmented last mile delivery system in urban areas. This has consequences for congestion patterns because the nature of the loading and unloading patterns for the vans is very different from that applying to trucks where more specialized space is often required.

All three cities also face faster increases in freight transport activity compared with personal travel. This means that the importance of considering freight transport within overall transport policies will be even greater in the future. However, the targets established to influence this are rather diverse.

The scope to retime deliveries to the off peak hours (OHD) is also evident in the three cities but so far progress has been rather limited. Regulations governing noise and the scope and influence of different authorities show some clear differences between the three cities. Governance is important in understanding how OHD can be enabled and encouraged.

4 Conclusion

The paper highlights the need to consider freight transport initiatives alongside other developments in travel and transport and in the wider context of urban development. For example, if cities are able to encourage denser residential patterns with a lower reliance on car use then one impact could be a rise in the need for freight transport to fulfil home delivery and last mile consumer requirements. These factors need to be considered together if suitable sustainability plans are to be implemented. Simply trying to restrict freight vehicle activity or setting arbitrary targets will not lead to the best outcomes.

It is clear that there are benefits from a comparative approach and this paper represents a modest step in that process. A more comprehensive and shared set of data for major cities would be valuable to researchers and policy makers. It would also enable a stronger evidence-based assessment of initiatives that come from both public and private sectors.

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