



SELECTED PROCEEDINGS

MEASURES FOR ACHIEVING GREEN AND EFFICIENT URBAN FREIGHT TRANSPORT

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ABSTRACT

The project *Green Urban Distribution* aims at identifying and demonstrating green and efficient solutions for urban freight distribution through improved organization, service innovation and the application of technology. The successful introduction of such solutions depends on the acceptability and receptivity of involved stakeholders. Stakeholders in this case include carriers, end-receivers and local authorities. This paper presents stakeholder evaluations of two specific measures aimed at increasing the utilization of street areas and increased 24/7 utilization: mobile depots allow for the reallocation of land, whereas night and evening deliveries promote urban goods distribution in periods with low traffic and disperse distribution activities across 24 hours. The paper finds that stakeholders are reluctant towards mobile depots, but that night and evening deliveries might prove an effective tool for promoting green and efficient urban freight transport.

Keywords: Urban freight transport, stakeholders, mobile depot, night deliveries

INTRODUCTION

The distribution of goods is an important prerequisite for living cities with a concentrated population and a competitive business sector. Goods distribution is crucial for the economic system in distributing goods to retailers, commercial establishments, offices and homes. However, urban freight distribution is characterized by challenges related to lack of coordination between actors in the logistics chain, inaccessible and unavailable loading zones, ineffective stock receipts and ad-hoc events requiring improvised solutions. As this paper only deals with freight the concept urban distribution means urban freight distribution.

The European Commission's White Paper *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* points to several developments for reducing emissions from urban freight. These include ITS solutions for

improved utilization of infrastructure, low emission vehicles, night deliveries, consolidation centers and a more efficiently organized interface between long distance and last-mile freight transport.

The development of more efficient and environmentally friendly urban goods distribution depends on increased knowledge and cooperation between private business and authorities. The project *Green Urban Distribution* aims at identifying and demonstrating green and efficient solutions for urban goods distribution through improved organization, service innovation and the application of technology. The project is funded by The Regional Research Fund in Norway, and the Environment Department of the city of Oslo is the project owner. The project is carried out in collaboration with central transport businesses, goods owners, transport organizations, vehicle and technology suppliers, the Norwegian Public Roads Administration and research institutions. The main purpose of the project is to develop green and efficient distribution solutions in the city center of Oslo, aiming at i) improved utilization of street areas, ii) improved 24/7 utilization, and iii) utilization of technology such as energy efficient vehicles and unmanned stock receipts.

The successful introduction of such solutions, however, depends on the acceptability and receptivity of involved stakeholders. It is important to recognize and adequately understand the concerns of different stakeholders in order to successfully implement city logistics policies (Stathopoulos et al. 2011). One of the most important predictors of a measure's feasibility is its consequences to each involved stakeholder. Stakeholders will adhere to a measure only if it will not inflict any negative consequences upon them (Rogers 1983), or if positive consequences outweigh negative ones. Further, negative consequences are typically more important to stakeholder evaluations than the measure's effectiveness (Schuitema and Steg 2005). Particularly important to the introduction of measures in urban distribution is the complexity of logistics chains. Policies that do not take into account complex interactions within the chain may yield suboptimal outcomes based on inaccurate projections of the likely effects (Hensher and Puckett 2004:3).

Hence, the effective introduction of solutions identified in the *Green Urban Distribution* project heavily depends on the ability to comply with the needs and prerequisites of stakeholders in the urban logistics chain. The study presented in this paper will provide a basis for designing viable and effective measures in order to achieve more environmentally-friendly and effective freight distribution in the city center of Oslo. This paper asks, *how do relevant stakeholders evaluate potential measures for facilitating green and efficient urban distribution?* More specifically, this paper presents stakeholder responses to one measure aimed at improving utilization of street areas and one measure aimed at improving 24/7 utilization: i) mobile depots, and ii) night and evening deliveries. As they allow for the reallocation of land, mobile depots are intended to improve the utilization of streets in urban areas. Night and evening deliveries are expected to promote urban goods distribution in periods with low traffic and disperse distribution activities across 24 hours.

STAKEHOLDERS IN URBAN DISTRIBUTION

Stakeholder perspectives are rarely emphasized in studies on urban distribution measures. Preliminary results from on-going projects are to a little degree reported, and the majority of projects are concerned with demonstrating solutions for improved urban distribution rather than documenting stakeholder evaluations. Consequently, existing knowledge on stakeholder perspectives is limited. In line with this, one purpose of this paper is to present stakeholder needs and concerns upon implementation of measures for green freight distribution.

A stakeholder is an actor or group of actors which affects or are affected by the phenomenon under study (see also Freeman 1984). Among stakeholders traditionally identified in logistics are receivers, carriers and forwarders (Ogden 1992), but recent research also emphasizes the involvement of policy makers, decision makers and local authorities (Lindholm 2012, Russo and Comi 2010, Stathopoulos et al. 2011).

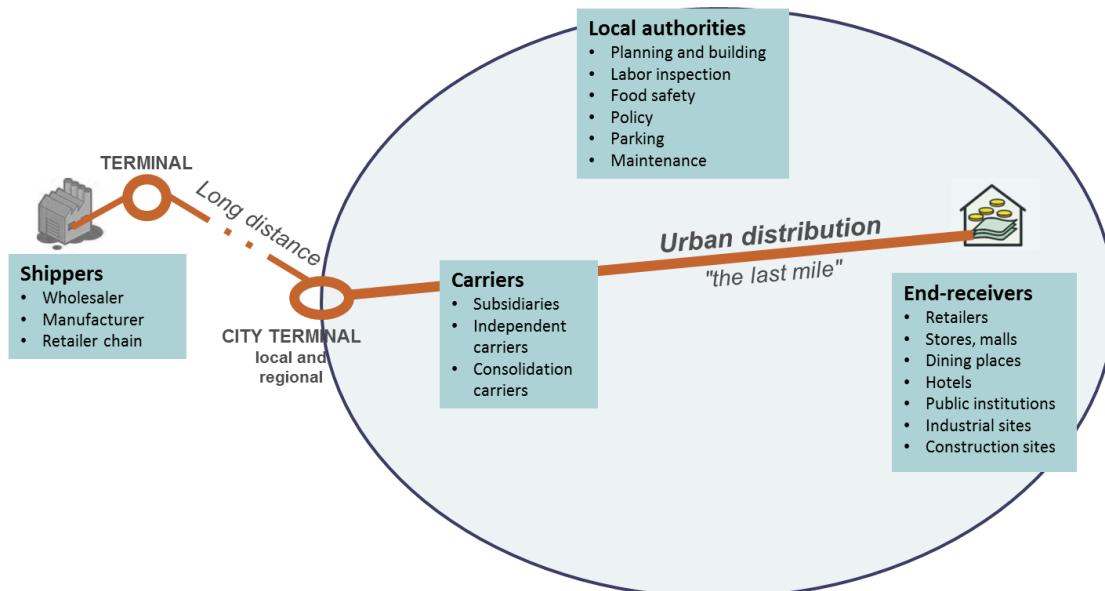


Figure 1 – Stakeholders in the urban distribution chain

Research has identified carriers, end-receivers and local authorities as the most relevant stakeholders in the *urban* distribution chain (Lindholm 2012, Russo and Comi 2010, Stathopoulos et al. 2011). These are also considered vital for the introduction of measures in the city of Oslo, and are the main focus of this study. Figure 1 shows stakeholders and their interrelations in the urban distribution chain, whereof three are explicitly included in this study. As most measures for achieving green and efficient urban distribution are directed at carriers, the majority of research involving stakeholders focuses on this group. Hence, there is more available knowledge regarding carrier responses to potential measures, and their needs and prerequisites related to urban distribution policies. Although acknowledged as important stakeholders, end-receivers and local authorities have received less attention.

Carriers

Freight carriers are heterogeneous and not easily defined. Whereas some carriers are subsidiaries of wholesaler companies distributing own products to retailers, others are independent carriers providing third-party logistics. Yet others are consolidation carriers facilitating transport services between customers (transport users) and smaller transport providers. Consequently, size, economy and influence vary significantly between carriers, but their general purpose is to collect, transport and deliver goods commissioned by manufacturers, wholesalers and receivers. The objective of freight carriers is profit growth, which they seek to achieve by minimizing transportation costs and maximizing sales (Taniguchi and Tamagawa 2005). Consequently, carriers seek to collect and deliver goods as efficiently as possible by optimizing load capacity, co-loading and delivery routes. This is also reflected in the literature, which primarily relates carrier challenges to the planning of pick-up and delivery, vehicle routing and operational costs (Stathopoulos et al. 2011).

End-receivers

End-receivers are a complex group, but in general receivers of goods respond to the demands of the final consumers (Stathopoulos et al. 2011). Some end-receivers are retailers or companies operating stores and dining places, but they also include hotels, public institutions and other business requiring regular deliveries. End-receivers could further be industrial or construction sites depending on the delivery of goods and materials to maintain production. End-receivers vary both in turnover and number of employees, whether they are part of a larger retailer chain or operate independently. Some are located in streets, others at shopping malls. These variations suggest that different end-receivers can influence and be influenced differently by measures directed at urban distribution.

End-receivers are the final link in the logistics chain, and their main tasks are related to commissioning and receiving deliveries. Commissions can be made to wholesalers, manufacturers or departments within own organization, but end-receivers are in most cases responsible for being present and receiving deliveries themselves. The primary concern of end-receivers in urban distribution is keeping personnel expenses low and securing staff appropriate to handle designated tasks, e.g. receiving goods.

Local authorities

Although they to a varying degree are aware of their potential influence (Lindholm 2012), local authorities can influence both when and how urban distribution is performed. However, local authorities consist of a range of departments with different and potentially conflicting goals, rationalities and motivations. Local authorities can among others include labor inspection agencies, food safety authorities, agencies for planning and building services, police and parking agencies as well as local, regional and federal maintenance departments. Combined, these actors represent a multifaceted influence.

The heterogeneity of local authorities suggests great variations in terms of tasks and responsibilities, but one of the responsibilities of local authorities is to facilitate green and efficient urban freight transport. Their role is to define the policy scenario within which private stakeholders operate (Stathopoulos et al. 2012:36) and to revitalize the city both economically and environmentally (Taniguchi and Tamagawa 2005:3064). Research shows, however, great variation in the degree to which local authorities consider urban distribution a public responsibility. A study among 94 Swedish municipalities found that local authorities commonly consider urban distribution a non-public issue and that the transport industry itself is responsible for optimizing urban distribution (Lindholm 2012:142). Dablanc (2007) argues that local authorities are aware that they should control goods transport activities because of their impact on the urban environment, but that most authorities do not know how.

As the degree to which local authorities consider urban distribution a public matter varies, so do their perceptions of problems and goals related to green and efficient urban distribution. According to Russo and Comi (2010) the main objective of local authorities is to make cities attractive to visitors and residents, while minimizing negative effects of transport. Hence, local authorities can introduce measures aimed at urban distribution which can facilitate private and public involvement alike, stimulate interest and commitment to industrialist measures and provide financial and legal counseling (Browne et al. 2012).

Although measures developed and introduced by local authorities are included in studies of urban distribution, studies do to little degree investigate the reasoning, reflection and handling of these measures by local authorities. Further, research is little devoted to investigating the local authorities' interaction with other stakeholders in the design of such measures. Stathopoulos et al. (2012:36) stress that local authorities tend to ignore the nature of logistics in the design of measures and treat other stakeholders as opponents rather than partners. This is presumably related to cultures and traditions within public agencies which influence what problems to prioritize and what solutions to choose, and which consequently can represent significant barriers for succeeding with measures directed towards urban distribution (Lindholm 2012).

SELECTED MEASURES IN URBAN DISTRIBUTION

There is a growing concern with environmental effects of urban distribution, and the European Commission's previously mentioned *Roadmap* stresses the need for prioritizing last mile transport in achieving CO₂ free city logistics in major urban centers by 2030. Thus, there is a significant amount of research on urban freight distribution and a number of past and on-going projects investigating city practices and city initiatives in urban freight distribution. The following section presents previous and on-going research on urban distribution measures and their influence on stakeholders.

Mobile depots

Several projects aim at improving the *utilization of street areas*, and propose alternative delivery systems. For instance, the purpose of the CITYLOG¹ project is to reduce unsuccessful deliveries when end-receiver is not present by decoupling parcel delivery by carriers and end-receivers picking up their goods. As part of this project, a solution called BentoBox (a mobile "pack-station" with removable trolleys) has been demonstrated in several European cities and found technically and operationally feasible (Quak et al. 2012). A similar practice is facilitated by DHL and other European postal services. The objective is to eliminate the need for end-of-chain delivery by motorized vehicles by use of pack-stations where end-receivers can pick up, frank and send parcels 24 hours a day. Further, the STRAIGHTSOL² project aims to increase efficiency of deliveries in city centers by use of mobile depots placed on central locations in the inner city, where last mile deliveries are made by electric tricycles.

Other practices for improved utilization of street areas are based on multiple use lanes (CIVITAS³ SMILE), route optimization (CIVITAS MIMOSA), environmentally friendly vehicles (FIDEUS⁴, Cargohopper, ECOLOGISTICS⁵), and intelligent traffic management (CIVITAS RENAISSANCE). Further, consolidation represents an important aspect of mobile depots in this study. Several projects have demonstrated use of consolidation centers (CIVITAS VIVALDI, CIVITAS SMILE, TRAILBLAZER⁶, ELCIDIS⁷). The general purpose of these projects is to reduce the presence of freight vehicles in city areas through consolidation, alternatively supplemented with electric vehicles on last mile transport.

Mobile depots are one of several possible solutions for improving land use and providing a more optimal *utilization of city streets*. This lies primarily in opportunities for reallocating land. There is limited research on stakeholder perceptions of mobile depots, but certain studies investigate stakeholder assessments of other measures with similar objectives. For instance, distribution or consolidation centers are an essential part of solutions for mobile depots. Urban distribution centers can represent an arena for consolidation of deliveries transported to inner mobile depots in cities outside peak hours (see for instance Regan and Golob 2005). The ELCIDIS project showed that consolidation in so-called distribution platforms was associated with a three-hour reduction in the time carriers spent making deliveries. Additionally, eliminating stress from inner city deliveries improved working conditions for drivers. However, in a study among logistics stakeholders Stathopoulos et al. (2012) found that carriers are more negative to urban distribution centers than other stakeholders. The successful introduction of distribution centers depends on the commitments of all involved stakeholders, and the involvement of these in early stages of the decision process (van Duin

¹ CITYLOG: Sustainability and efficiency of City Logistics, www.city-log.eu/

² STRAIGHTSOL: Strategies and measures for smarter urban freight solutions, www.strightsol.eu/

³ CIVITAS: Cleaner and Better Transport in Cities, www.civitas-initiatives.org

⁴ FIDEUS: Freight intelligent Delivery of Goods in European Urban Spaces, www.fleetrunner.net/FRCommon_fideus_overview.htm

⁵ ECOLOGISTICS: www.calparma.eu/ecocity

⁶ TRAILBLAZER: Transport and innovation logistics by local authorities with a zest for efficiency and realisation, www.trailblazer.eu/content.php

⁷ ELCIDIS: Electric Vehicle Distribution Systems, www.elcidis.org

et al. 2010). For instance, the SUGAR⁸ project shows that successful implementation depends on the high participation of retailers and suppliers alike.

There is limited research on end-receiver evaluations of mobile depots or other measures for improved utilization of street areas. A recent study, however, surveyed end-receivers' support of twelve different policy measures (Stathopoulos et al. 2012). It finds that end-receivers worry about illegal parking in loading zones, and that increasing the number of loading zones as well as introducing systems for electronic booking of loading zones are among measures most supported by end-receivers. End-receivers are further fairly positive towards urban distribution centers and so-called pick-up points for last mile transport, which resemble mobile depots. Another study examined the effects of an urban consolidation center more directed against retailers (van Rooijen and Quak 2010), but has yet to report explicit stakeholder evaluations.

Night and evening deliveries

Several projects also aim at reducing the impact of freight transport by use of *delivery time windows*. In the city of Paris trucks are banned during day-time, and since 2007 afternoon deliveries are only allowed by vehicles which are electric, gas or follow increasingly stringent euro standard requirements. As seen below, the C-LIEGE⁹ project has pointed to several benefits and disadvantages resulting from such practice. Additionally, the CIVITAS MIRACLES project demonstrated night deliveries with adapted trucks to reduce pollution and avoid blockages on narrow streets. Results show significant reductions in fuel consumption and emission levels, and that journey times were reduced by 50 %. In a Swedish study, stakeholder representatives gave their evaluations of a night delivery trial in the city of Stockholm (Franzén and Blinge 2007) and identified a range of positive and negative aspects. The study found the primary resistance towards night deliveries to exist among end-receivers, who preferred day-time deliveries as they involve lower wage expenses and lower risks of robbery.

A small number of studies investigate the carrier responses to night and evening deliveries. These typically revolve around time-based access restriction and time-windows introduced to promote deliveries outside peak traffic. Research shows that carriers already try to avoid peak hour deliveries because they are considered inefficient, unpredictable and involving greater fuel consumption (Vilain and Wolfrom 2001). Night deliveries involve shorter and more reliable travelling time and do not require vehicle alterations (Allen et al. 2003). Yet, they are associated with increased personnel costs, and noise regulations have proved challenging to carriers in several European cities (Quak and Koster 2006). Among other things, the C-LIEGE project found that night deliveries in the city of Paris inflicted higher costs for silent vehicles and loading equipment upon carriers. Still, carriers also experienced increased efficiency and less delay. Similar findings are reported in the CIVITAS MIRACLE project demonstrating night deliveries in Barcelona: although carriers had to invest in silent vehicles and equipment, loading capacity increased and delivery times were reduced by one

⁸ SUGAR: Sustainable Urban Goods Logistics Achieved by Regional and Local Policies, www.sugarlogistics.eu

⁹ C-LIEGE: Clean last mile transport and logistics management, www.c-liege.eu

third compared to day-time deliveries. An off-hour delivery trial recently conducted in New York showed that the switch to night deliveries brought about significant economic benefits, travel speeds were significantly increased, and service times were reduced (Holguin-Veras et al. 2012). The trial further showed that the receivers are key decision makers in the logistics chain, and that the ability of carriers to unilaterally change their delivery times is very limited.

Research on time-windows places greater emphasis on end-receivers. End-receivers are primarily concerned with deliveries being made during opening hours (Russo and Comi 2010), which to a certain degree would conflict with night and evening deliveries. The CIVITAS VIVALDI project showed that end-receivers often demand particular delivery times. Yet, end-receivers involved in the ELCIDIS project claimed night-deliveries improved the environment surrounding their business as traffic and congestion was reduced. Studies show that end-receivers are less positive towards measures which require behavioral change and alternations in their business operation (Stathopoulos et al. 2012). In a Dutch study, end-receivers claimed they would continue regular deliveries despite time-window restriction in order to reveal whether restriction are in fact monitored (Quak and de Koster 2007). The main reason for their resistance towards night deliveries lies in perceived increased risks and exposure to crime for both personnel and goods. Additionally, night deliveries are expected to involve wage increases as someone will have to be present to receive and validate deliveries. The C-LIEGE project found that night deliveries in the city of Paris were accompanied by personnel costs, which would burden small business in particular. Similar results were reported from Barcelona in the CIVITAS MIRACLE project. End-receivers expect increases in operating costs, equipment and wage increases from night and evening deliveries to exceed potential fees from making deliveries outside designated time-windows (Holguín-Veras 2008).

Few studies of urban distribution include local authorities. Several projects on urban distribution refer to aspects of measures which are typically relevant to local authorities, but without making an explicit connection. For instance, end-receivers involved in the ELCIDIS project stated that the introduction of night deliveries did not result in increased noise levels compared to day-time traffic. Noise could in part be expected to concern local authorities responsible for the welfare of inner city residents. Similar findings were reported by the CIVITAS MIRACLE project. Additionally, the C-LIEGE project found that night deliveries involve a more optimal use of public space, which is particularly important as there exists little available urban land for logistics activities (Dablanç 2007:281).

METHODS

Literature review

The purpose of this paper is to present stakeholder perceptions and assessments of mobile depots, and night and evening deliveries. In order to develop an appropriate theoretical and methodological framework, a limited review of existing research on stakeholders in urban distribution was performed before the stakeholder interviews took place. The review included

30 publications published in the period between 2000 and 2012, which aimed fully or partially at understanding the role of stakeholders in urban distribution. Based on the literature review carriers, end-receivers and local authorities were identified as the most relevant stakeholders for implementing measures for more green and efficient urban distribution in Oslo.

The selection of included measures was based on the literature review of stakeholders, as well as a review of previous and ongoing projects where solutions for more efficient and environmentally friendly urban distribution have been implemented (Roche-Cerasi 2012). Measures were selected to represent problem descriptions related to both the improved utilization of street areas as well as improved 24/7 utilization. Additionally, measures were selected based on previous and current demonstrations in European cities. By reference to urban logistics practices across Europe (see Roche-Cerasi 2012), mobile depots and night deliveries were identified as two potentially effective measures suited for introduction in Oslo. They were further considered appropriate proxies for stakeholder evaluations of measures aimed at improved utilization of street area and improved 24/7 utilization in general.

Pilot interviews

After identifying the most relevant stakeholders, pilot interviews were performed with representatives from all groups. The purpose of the pilot interviews was to establish a basic understanding of the stakeholders' operations, challenges and problem areas regarding urban distribution in Oslo, and to establish mutual trust and confidence. The interviews further illustrated the individual stakeholder groups' level of freedom of action, competence, and action plans not taking other stakeholders into consideration. The interviews confirmed that stakeholder groups identified in existing research also were relevant to the case of Oslo.

Focus group seminar

Representatives from included stakeholders were invited to a focus group seminar. The intention of the seminar was to gather input on the specific measures, as well as to provide an arena for debate and discussion in which potential conflicts and clashes of interest between stakeholders could be brought to the fore. In particular, the seminar aimed at demonstrating ways in which needs, challenges and latitudes are influenced by the positions and premises of other stakeholders.

Table I – Definition of included measures

Mobile depots

Here, mobile depots are defined as containers placed on strategic points within a given geographical area. Goods to end-receivers located within the area are delivered in the same depot. The depots arrive from consolidation centers where goods have been collected, organized and transported to the depot area in the early morning. Goods are available to end-receivers for a certain period of time, for example until noon, when traffic is low. End-receivers are responsible themselves for collecting own deliveries before the depot is removed. End-receivers are also free to return packaging waste by loading it into the emptied depot.

Night and evening deliveries

Night and evening deliveries are implemented by restrictions or other incentives to reduce delivery vehicles' access to urban areas during daytime. Here, night and evening deliveries are defined as deliveries performed between 6 pm and 6 am, but no particular time window within this period is specified.

A total of 15 stakeholder representatives participated: four representatives from carriers, four representatives from end-receivers and seven representatives from local authorities. The carrier group consisted of representatives from two large carriers, as well as representatives from two large interest groups. End-receivers represented a large retailer chain, one trade association and one goods delivery interest group. Local authorities were represented by national and regional levels of the Norwegian Public Roads Administrations, as well as five representatives from the city of Oslo. City representatives in this project were responsible for transport planning, parking, traffic safety, universal design, road maintenance, environmental issues and investments.

There were two sessions of focus group discussions. In the first session, the individual stakeholder groups were assembled separately to discuss prerequisites and needs related to the potential introduction of mobile depots, night and evening deliveries. Stathopoulos et al (2011) argue that separate stakeholder discussions allow for a more uninhibited description of problems and issues without the presence of adversaries. Stakeholder groups were provided with documents explaining the purpose and functioning of the measures, which were presented to stakeholders as described in Table I. Measure definitions are based on a review of best practices on European cities (Roche-Cerasi 2012) and adapted to the specific Oslo context taking into consideration geographical factors, urban design and competitive conditions within commerce and the transport industry.

In the second session stakeholder groups presented their individual evaluations, before all stakeholders were invited to discuss each other's inputs. The purpose of the second session was to make stakeholders aware of the views and perspectives of others, as well as building a mutual understanding of problem descriptions and potential measures among stakeholders.

SWOT analysis

In order to systematize inputs, stakeholders were asked to perform SWOT analyses. SWOT analysis as applied here is a tool for identifying strengths, weaknesses, opportunities and threats related to the implementation of specified measures. Each stakeholder group developed SWOT matrixes which described their views on the measures. The method of SWOT analysis cannot be traced back to a single publication and is not the result of an identifiable academic contribution. Rather, SWOT analysis has emerged as a commonplace business procedure without any documented epistemology. However, a common perception is that SWOT analysis is a strategic planning method which involves identifying internal and external factors that are favorable or unfavorable to the implementation of included measures. Despite different approaches and applications of SWOT, all advocates maintain a

clear distinction between external factors (threats and opportunities) and internal viewpoints (strengths and weaknesses) (Hill and Westbrook 1997:47).

Table II – Description of SWOT analysis

Strengths	characteristics of the measure that give it an advantage compared to other measures
Weaknesses	characteristics that place the measure at a disadvantage relative to other measures
Opportunities	external chances to reach the objectives of the measure
Threats	external elements that could endanger the implementation of the measure

Although normally applied to strategic business planning, SWOT analysis could also prove beneficial in assessing the potential of transport policy measures. Good performances are the result of correct interaction between stakeholders and their internal or external environment (Houben et al. 1999:125). In a study similar to this, Franzén and Blinge (2007) performed a SWOT analysis to evaluate stakeholder perception of night deliveries. They argue that SWOT analysis is appropriate to illustrate qualitative data which represents the interpretations and experiences of different actors.

In the following descriptions of the included stakeholders' SWOT analysis, internal and external factors are not treated separately. Firstly, stakeholders had trouble with clearly understanding differences between threats and weaknesses on one hand and strengths and opportunities on the other. Thus, their discussions revolved more around what they considered to be positive and negative attributes related to each measure. Secondly, it has proved difficult to make an empirical distinction between internal and external factors. As stakeholder functions and operations in urban logistics are characterized by interaction and cooperation, it is difficult to define an influential factor as either internal or external. An internal factor of one stakeholder might very well represent an external factor to another. As such, the descriptions below do not refer specific components of the SWOT analysis, but rather to factors which by the stakeholders are presented as *facilitators* (strengths and opportunities) or *obstacles* (threats and weaknesses) to successful measure implementation.

RESULTS

Evaluations of mobile depots

Facilitators

To the *carriers* an obvious benefit of mobile depots would be reduced fuel costs as more transport would be performed in periods with little or no congestion, but this is to a little degree emphasized in focus group discussions. Carriers expect, however, improvements in EHS (environment, health, safety) as drivers are relieved from making doorstep deliveries of potentially heavy goods. Such obstacles would, however, be transferred to end-receivers¹⁰.

¹⁰ The Norwegian Labour Inspection Authority advises against carrying goods across a distance longer than 20 meters and carrying goods of more than 25 kilos (<http://www.arbeidstilsynet.no/artikkel.html?tid=78627>)

The primary benefit to *end-receivers* is related to increased flexibility: end-receivers can collect their deliveries when time and work load allows it, according to the operation of their business. This is expected to reduce noise and disturbance to visitors or customers. Mobile depots further represent a more efficient strategy for handling and organizing goods into a single delivery and make it easier to dispose of packaging waste.

Local authorities consider mobile depots an opportunity to strengthen existing policies in restricting day-time access to the city center. They expect mobile depots to contribute to reduced congestion and emission concentrations, and consider mobile depots useful alternatives when adequate, individual stock receipts are not an option. Additionally, mobile depots allow the reallocation of land from parking spaces to spaces for placement of depots, and might provide local authorities with an incentive to allow freight transport in public transit lanes and pedestrian streets outside periods with high traffic volumes.

Obstacles

One of the stakeholders' main objections to mobile depots is that these are inadequate measures in covering the main share of urban freight transport. Mobile depots are perceived as relevant only to carriers of certain types of small goods: carriers of large or heavy goods depend on making doorstep deliveries, and delivering fresh foods, refrigerated and/or frozen products involves specific storage requirements. Thus, mobile depots are merely considered a contribution to more efficient freight in certain segments. Carriers additionally voice three main concerns. Firstly, their acceptance of mobile depots rests heavily upon business models. They expect a cost increase of 20 % as a result of increased consolidation, which they are not willing to cover themselves. Secondly, they stress that additional consolidation places increased strain on the value chain and reduces the flexibility of the individual carrier. Longer delivery schedules and careful planning of shipments to end-receivers make express deliveries less feasible. Thirdly, carriers worry that the introduction of mobile depots leads to unintended changes in the freight market. They are concerned that a new, unregulated market for the transport of goods between depots and end-receivers will emerge, with actors who do not necessarily comply with existing norms and protocols for urban distribution.

Table III – Evaluation summary of mobile depots

	Facilitators	Obstacles
Carriers	<ul style="list-style-type: none"> • EHS improvements • Reduced fuel consumption 	<ul style="list-style-type: none"> • Relevant to small share of urban distribution • Business model • Additional consolidation • New, unregulated market

Table III – Continue; Evaluation summary of mobile depots

	Facilitators	Obstacles
End-receivers	<ul style="list-style-type: none"> • Increased flexibility • Less noise and disturbance to customers • One, single delivery 	<ul style="list-style-type: none"> • EHS, increased work load • Last mile transport • Safety and delivery security • Distortion of competition
Local authorities	<ul style="list-style-type: none"> • Support existing policies • Reduced congestion and emission levels • Alternative to individual stock receipts • Reallocate land from parking • Allow freight transport in public transit lanes and pedestrian streets 	<ul style="list-style-type: none"> • Land use conflict with other road users • Design of depots • Increased maintenance • Relocation of business • Two delivery regimes

As mentioned, *end-receivers* expect increased workloads which will possibly conflict with existing work environment norms if mobile depots are introduced. Secondly, end-receivers fear the challenging last mile transport of goods from the depot in an urban environment, typically requiring surpassing road blockages from road maintenance and particular weather conditions, tram tracks and traffic. Thirdly, they raise the issue of safety and delivery security. The safety of goods and personnel might be compromised both in the depot and during transport to the end-receiver, and they emphasize that mobile depots should allow each end-receiver access only to his or her goods. Finally, end-receivers worry that the combined inconveniences of mobile depots will contribute to distortion of competition in favor of large, suburban shopping malls and put the ideal of living cities at risk.

The most prominent obstacle raised by *local authorities* is related to land use. Mobile depots require designated spaces, and as city center streets are already crowded with a variety of road users, local authorities need to decide what road users to prioritize and whose space to reduce for the benefit of mobile depots. Secondly, local authorities worry about complaints regarding the design of mobile depots and anticipate complaints regarding the depots' contribution to the esthetical environment. Thirdly, mobile depots would require increased road maintenance to ensure safe and unhindered transport from depots to end-receivers, particularly during winter time. Local authorities must take into account the design of streets and sidewalks with additional emphasis on universal design, smooth surfaces and immersed curbstones. It will also fall on local authorities to provide signposts and surveillance for assuring the availability of spaces designated for depots, with increased pressure for monitoring parking restrictions and regulations and sanctioning violations. Finally, local authorities express concerns regarding structural changes occurring as a result of mobile depots deliveries in urban areas. Firstly, they worry that the inconvenience associated with depots on behalf of end-receivers will cause business to relocate outside the city center and compromise goals of a living city. Additionally, local authorities repeatedly stress that deliveries to mobile depots must *replace* the existing delivery regime. They have little faith in mobile depots replacing all deliveries and believe the introduction of mobile depots will create two sets of delivery regimes: the existing regime which requires regulation of spontaneous (ordinary) deliveries, and the regulated regime for mobile depots.

Evaluations of night and evening deliveries

Facilitators

As opposed to discussions of mobile depots, *carriers* are generally positive towards night and evening deliveries. The main reason is the potential for cost reductions. Night and evening deliveries allow for distributing terminal management, operations and deliveries across a 24 hour period, which enhances the utilization of vehicle capacity, contributes to more time efficient deliveries, more accessible street areas and increased percentage filling with more deliveries per trip. Deliveries outside heavy traffic are anticipated to provide drivers with a more stable and calm working environment, and to significantly contribute to reduced fuel consumption. In total, carriers expect savings from continuous operation to exceed increased salary expenses related to shift work, and are thus willing to increase tariffs in order to facilitate night and evening deliveries. Additionally, carriers consider *key contracts* potentially helpful to the introduction of night and evening deliveries. Key contracts are legal documents specifying arrangements of deliveries made when the end-receiver is not present. Carriers are equipped with keys or codes to the receipt, while end-receivers have 24 hours to control and validate deliveries. Key contracts are most suited for carriers with regular routes and large deliveries. The Norwegian lock system SLUS is also mentioned as an alternative to key contracts.

End-receivers are also more positive towards night and evening deliveries. Primarily, they will benefit from a more evenly distributed workload, and emphasize opportunities to do stock replacements in periods with otherwise low activity. Less noise and disturbance during opening hours create a more inviting atmosphere to existing and potential customers, and might contribute to increased competitiveness. Secondly, end-receivers appreciate technological approaches to facilitating night and evening deliveries. They already actively engage in key contracts, and are favorable to other solutions which render the presence of staff unnecessary. Thirdly, night and evening deliveries are considered an opportunity to place incentives on the retailer chain as a whole. End-receivers believe deliveries within retailer chains could be more organized and coordinated, contributing to more time and cost efficient goods distribution in urban areas.

One of the primary policy goals of *local authorities* is to reduce local pollution. More evenly distributed traffic is expected to produce less congestion and less pollution, and in particular the reduction of heavy duty vehicles in peak hours could contribute to keeping emission levels below limit values. Additionally, distributing traffic more evenly across 24 hours increases the utilization of land and city areas. Local authorities expect removing delivery vehicles from daytime traffic to reduce conflicts with pedestrians and public transport and improve safety, accessibility and efficiency for other road users and other traffic. Such improvements might encourage travel by foot, bike or public transport. Thirdly, public authorities encourage noise reduction requirements to reduce disturbance, and stress that confining deliveries between 6 pm and 12 pm would significantly reduce noise complaints. Finally, they suggest that night and evening deliveries might increase the general safety by increasing activity and the presence of sober persons in city streets.

Obstacles

Carriers mainly raise three objections towards night and evening deliveries. Their primary concern is EHS, and carriers are unsure of what reaction they might face from labor organizations. This is above all related to working hour inconveniences and regulations, driving and resting regulations, fear of robbery, theft and violence. Their second concern is delivery predictability: end-receivers might not be willing to or be prevented from showing up. If key contracts are involved, difficulties related to keys, codes and access might prevent carriers from making deliveries. Finally, carriers believe consolidation might prove challenging if not all end-receivers welcome night deliveries, which would require the development of two distinct consolidation and delivery regimes.

In terms of EHS, *end-receivers* are faced with similar issues as carriers. Unless fully automated solutions are installed, night and evening deliveries will require staff being available at inconvenient times. Again concerns are related to demands of labor organizations, legal aspects surrounding work contracts and safety issues related to night work. Additionally, end-receivers stress that night and/or evening deliveries must be punctual and predictable to keep working hour inconveniences to a minimum. Finally, end-receivers stress that not all buildings and premises are suitable for technological solutions (e.g. lock systems), which makes night and evening deliveries inevitably related to increased staff presence for some end-receivers.

Table IV – Evaluation summary of night and evening deliveries

	Facilitators	Obstacles
Carriers	<ul style="list-style-type: none"> • Cost reductions exceeding increased costs • Key contracts/lock systems 	<ul style="list-style-type: none"> • EHS, working hours • Delivery predictability • Two consolidation and delivery regimes
End-receivers	<ul style="list-style-type: none"> • Work load distribution • Less noise and disturbance to customers • Technology and key contracts • Incentives on retailer chains 	<ul style="list-style-type: none"> • EHS, working hours • Unpredictable deliveries • Staff required in buildings not suited for technological solutions
Local authorities	<ul style="list-style-type: none"> • Lower emission concentrations • Improved land use • Encourages green transport • Noise reduction regulations • Increased safety 	<ul style="list-style-type: none"> • Conflicts with goals of living city • Land use, conflict with parking spaces • Around-the-clock maintenance • Legality

To *local authorities*, the greatest obstacles towards night and evening deliveries are potential conflicts with goals of a living city: local authorities wish to facilitate a viable city center involving both business activities and permanent residents. On one hand, such conflicts are related to noise disturbance to neighboring environments, and local authorities expect difficulties with getting approval for night or evening deliveries in residential areas. On the other hand, night and evening deliveries could be a threat to the living city if they are so

inconvenient to end-receivers that they relocate outside the city center. The second obstacle identified by local authorities is related to land use: successful night and evening deliveries require signposts with particular traffic and parking regulations applying to particular periods and particular areas. As different road users compete for the same space, delivery spaces are typically in conflict with parking spaces. Third, local authorities emphasize that night and evening deliveries would require around-the-clock maintenance, and that lack of loading bays might cause delivery vehicles to obstruct road maintenance. Finally, local authorities stress that the successful implementation of night and evening deliveries depends on the documented legality of activities and their consequences, such as night work and noise levels.

CONCLUDING DISCUSSION

The purpose of this study has been to collect inputs from relevant stakeholders on measures for more sustainable urban distribution, with a particular focus on mobile depots and night and evening deliveries. The study shows that stakeholders are in general skeptical to the introduction of mobile depots, and that this skepticism particularly rests on the inability of mobile depots to encompass the majority of urban deliveries. Mobile depots would further require significant alterations of the organization of logistics, particularly among carriers and end-receivers. Physical inconveniences experienced by carriers today are expected transferred to end-receivers. Local authorities are concerned with the contribution of mobile depots to the esthetical environment, and stress the importance of deliveries to mobile depots replacing existing deliveries.

Night and evening deliveries were described more positively by all stakeholders. To carriers this results from opportunities to distribute operations across longer periods of time with consequent savings from a more efficient logistics system. Similar expectations are found among end-receivers who already seek to establish key contracts and who will be able to reduce noise and disturbance during opening hours. Local authorities are primarily concerned with noise disturbance related to night deliveries in particular, but emphasize opportunities for improving conditions for other road users when day time deliveries are reduced to a minimum.

If a measure for implementation based on the stakeholder evaluations of this study should be prioritized, night and evening deliveries appear more appropriate than mobile depots. The introduction of night and evening deliveries will depend on a clarification of working hours and other EHS regulations. Further, a regulatory framework for night and evening deliveries should adhere to laws and regulations, and governing principles established. Among other things, requirements of silent vehicles and loading equipment should be specified, and routines for handling complaints and violations established. Regulations must also specify responsibilities related to the use of (preferably standardized) key contracts or other measure rendering the presence of end-receivers unnecessary. To accommodate end-receivers unable to facilitate unmanned stock receipts, delivery contracts should be as specific and predictable as possible to ensure a cost-efficient organization of work. Regulations should further specify the commitments and responsibilities of each individual stakeholder, including

carriers and end-receivers not making night and evening deliveries. As stressed by local authorities, introduced measures should encourage a *shift* in delivery strategies rather than supplementing existing strategies. Consequently, facilitating night and evening deliveries should take into account the combined organization of night and day-time deliveries and aim at a coherent delivery regime incorporating the needs and premises related to both delivery strategies.

Although stakeholders present mobile depots deliveries as less preferable than night and evening deliveries, similar practices have proved efficient across Europe. One reason for the skepticism against mobile depots might however rests on mobile depots being less familiar to stakeholders than night and evening deliveries. Research shows that the acceptability of transport policies increases with increasing knowledge, familiarity and experience with a measure (Bies et al. 1993, Gaunt et al. 2007, Tretvik 2006). Consequently, future introduction of mobile depots heavily depends on increasing stakeholders' scheme perceptions, but also detailed clarifications of responsibilities, commitments and business models.

One of the obstacles related to mobile depots could also stem from stakeholder perceptions of own roles. By taking into consideration the needs and premises of other stakeholder groups, each stakeholder will have to redefine its role and approach to urban freight transport. This is a general challenge with introducing new solutions: each stakeholder will have to revise its role in the logistics chain. For instance, as last mile deliveries were previously the responsibility of carriers, mobile depots would require end-receivers to collect own deliveries. Additionally, stakeholder perception of the roles of others could come into play. For instance, the focus group seminar revealed polarization and an inherent conflict between particular stakeholder groups. This suggests an underlying structural disagreement which might hamper future cooperation. As such, dissimilar areas of interest and priorities are expected to be a prominent challenge regarding the implementation of measures.

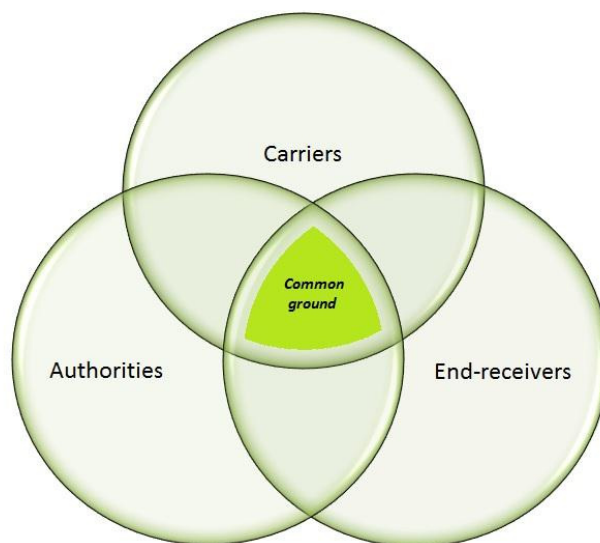


Figure 2 – Common ground of urban distribution stakeholders

Hence, the successful introduction of measures facilitating green and efficient urban distribution heavily depends on identifying the stakeholders' common ground. Common ground refers to congruent areas of interest where strengths and opportunities outweigh threats and weaknesses, or where the combination of facilitators and obstacles provide a nutritious breeding ground for effective measures (see figure 2). Identifying common ground is thus a matter of charting stakeholder needs and prerequisites.

This study is a contributor to the identification of common ground for measure implementation in the city of Oslo. The purpose of this study has been to chart stakeholder evaluations of potential measures for facilitating green and efficient urban distribution. It brings forward needs and prerequisites for three central stakeholders in city logistics, providing a basis for designing measures that are sustainable for all parts. This knowledge also helps decision-makers foreseeing the consequences of measure implementation and thus premises for achieving policy goals. Although included measures and stakeholders were selected within a specific local and national context, findings may very well be transferrable to urban transport systems in general.

In general, stakeholders display great commitment and positive attitudes towards solving problems in urban distribution. One purpose of this study has been to increase the stakeholders' awareness of each others' needs and premises in order to facilitate the evolution of policies which take into account the complex interaction of stakeholders. As such, this study might prove a cardinal step towards achieving viable and effective solutions for green and efficient urban distribution.

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