Final Report

Logistics schemes for E-commerce

Non-binding guidance documents on urban logistics
N° 4/6

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Glossary and definitions

3PL:	Third Party Logistics Service Providers
APL:	Automated Parcel Lockers
B2B:	Business to Business
B2C:	Business to Consumer
C2C:	Consumer to Consumer
EC:	European Commission
EU:	European Union
GDP:	Gross Domestic Product
GNSS:	Global Navigation Satellite System
HD:	Home Delivery
LSP:	Logistics Service Providers
NPO:	National Post Operators
ODD:	On Demand Delivery
PP:	Pickup Points
SPB:	Smart Parcel Box
UPS:	United Parcel Service
USO:	Universal Service Obligations
UVAR:	Urban Vehicle Access Regulation

Chapter 1 Introduction

Non-Binding Guidance Documents

This document is one of a series of six Non-Binding Guidance Documents (NBGDs) prepared within the scope of the Study on Urban Mobility - Preparation of EU Guidance on Urban Logistics (MOVE/C1/2014-370) as commissioned by the European Commission. The documents aim to help stakeholders understand the challenges brought about by logistic activities in an urban context, and identify the most suitable measures and actions to overcome these challenges.

This non-binding guidance document (N° 4 out of 6) covers the effects e-commerce has on urban freight transport and ways to mitigate its negative externalities.

Logistics schemes for E-Commerce

E-commerce is one of the main drivers of a more prosperous and competitive Europe, with significant potential for contributing to economic growth and employment[1].

The European Commission's Communication on e-commerce together with other EU initiatives[2] has identified the physical delivery of goods ordered online as being one of the key elements of e-commerce growth. Delivery services offered by e-retailers are one of the fundamental factors influencing a consumer's purchase decision. Currently, delivery and product returns are amongst the top concerns of both e-shoppers and e-retailers in the EU[3].

A study by Copenhagen Economics (important consultants in the European economy) has confirmed that delivery-related problems heavily influence whether e-shoppers finalise their purchases or abandon attempts to buy online.[4] Their research reveals that the most important aspects of delivery for e-shoppers are:

- Low delivery prices;
- Delivery to home address;
- Access to electronic delivery notifications and track and trace;
- Convenient return options.

Consumers often do not know what delivery options are available to them, when and how a parcel may be delivered to them, and how they can return it should they wish to. They complain about long delivery times and the lack of information about the delivery process. They frequently regard prices for cross-border delivery as being excessive.

E-retailers are under time pressure. The viability of their businesses depends on the ability of the delivery sector to deliver at low cost and in a convenient manner. This applies particularly to small players in the e-commerce market. Due to lower volumes, they have insufficient bargaining power to successfully obtain substantial discounts from delivery operators, and are thus confronted with less favourable delivery options. At the same time they lack the capacity to invest in their own delivery networks. In an environment characterised by economies of scale, they are not able to be competitive vis-à-vis larger e-retailers.

Delivery operators have to find appropriate responses to their customers' changing delivery expectations, while taking into account challenges such as the high cost of the first and last mile, or the decreasing willingness of customers to pay for home delivery. Making customers aware of the true price of transport is increasingly difficult.

Authorities (Regional/Local)

Freight transport resulting from e-commerce is, from a local authority point of view, seen as a "business issue" which more or less resolves itself since there is an economic interest in doing so. There is an interest from the transport operator´s side, amongst others, to have as efficient transport as possible. However, the possibilities of providing an efficient transport service are sometimes in conflict with, for example, regulations on infrastructure or passenger transport.

Urban authorities, confronted by complaints made by residents and various road users, have, for some time, responded reactively rather than proactively to the negative environmental impacts of urban freight. Accordingly, policy and regulatory measures implemented by urban planners have aimed at limiting rather than extending freight operations.

Cross-Border E-Commerce

Companies that wish to sell goods and/or services in foreign countries often face several challenges and obligations. Cross-border delivery operations are affected by a high number of additional regulatory and administrative requirements. Aside from issues such as internet security and data protection or e-payment, one of the biggest hurdles to the growth of cross-border e-commerce is e-logistics[5].

Private parcel and express operators also need to adapt to the rapid growth of e-commerce-driven B2C shipments, both nationally and across borders. These operators – who still dominate the cross-border parcel markets – need, in particular, to adapt their B2B-oriented operations to the needs of individual customers, and to invest in sorting capabilities, retail networks and parcel return systems.

The 2012 Commission's Green Paper "An Integrated Parcel Delivery Market for the Growth of E-Commerce in the EU"[7] sets out the main issues. It places particular emphasis on the cross-border delivery of parcels.

The Roadmap aims to address the following three objectives:

- Increased transparency and information for all actors along the e-commerce value chain;
- Improved availability, quality and affordability of delivery solutions;
- Enhanced complaints handling and redress mechanism for consumers.

Responses to the Green Paper consultation[7] and specific surveys, studies and workshops all confirm that delivery is a key factor in the overall development of e-commerce. Yet the expectations and needs of consumers and e-retailers are not always met in terms of speed, quality, reliability or cost of delivery[3]. The bulk of consumer complaints received by the European Consumer Centres Network regarding online cross-border transactions, concern problems with delivery.

E-commerce is also a spear action point in the EC's Digital Single Market initiative (adopted in May 2015[1]). It is built on three pillars: (i) better access for consumers and businesses to digital goods and services across Europe; (ii) creating the right conditions and a level playing field for digital networks and innovative services to flourish; (iii) maximising the growth potential of the digital economy.

[1] COM(2015) 192 final

More information on current actions following the Digital Single Market initiative can be retrieved at:
https://ec.europa.eu/commission/priorities/digital-single-market_en

The directive's first pillar is tackling geoblocking[2], aims to make cross-border e-commerce easier and will contribute to more efficient and affordable parcel deliveries. The Commission also launched an antitrust competition inquiry into the e-commerce sector in the European Union, which resulted in SWD(2017) 154 final.

The goal of these Non-Binding Guidance Documents (NBGD) is to support local authorities to implement sound urban freight logistics public policies, by providing non-binding guidance. The guidance primarily targets public authorities such as municipalities or local agencies, responsible for the management of the traffic, transport and transport infrastructures within urban areas. Furthermore, it may also benefit logistics and freight transport operators working in urban areas. No specialised background in logistics or freight transport is required to understand this document. More in-depth examples, references and practical guidance can be found in the fully referenced Technical Report on which this less technical NBGD is based.

[2] This means that online sellers discriminate consumers with regard to general terms and conditions, including prices, on the basis of for example their nationality, place of residence or even their temporary location.

Chapter 2 Delineation of the E-Commerce market

2.1 The Definition of E-Commerce

According to the OECD, "An e-commerce transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services does not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations" (OECD 2011, 637).

2.2 The E-Commerce Market

16% of the world's population in 2014 purchased goods and/or services online at least once[5]. In 2014, Asia-Pacific was the strongest B2C e-commerce region in the world. With a B2C e-commerce turnover of €581bn, it ranks ahead of Europe's €424bn and North America's €394bn.

E-commerce Europe has estimated the share of the e-commerce economy in the GDP to be 2.45%.[5] Together, the UK, Germany and France account for 60.2% of European e-commerce,[5] although their B2C e-commerce turnover growth has started to slow down[5].

Interestingly, although growth rates in most mature markets are levelling off, the overall European growth rate is stable due to the rapid growth of Eastern European e-commerce markets.[5] Decisive factors for the continuation of such growth will be higher disposable income, mobile internet through smartphones and tablets, and affordable, reliable and fast e-logistics delivery.

2.3 E-Commerce's Product Classification

B2C e-commerce includes all online transactions between business and consumers using desktop computers, laptops, tablets, smartphones, point-of-sales and smart wearables, for instance; through online shops, physical stores (online in store), email, QR (Quick Response) codes and catalogues[8].

Half of e-commerce sales directly translate into freight volume and deliveries. The other half is services, which do not generate deliveries. Therefore, data are misleading because the interest for our purposes is in physical goods.

In the US and Europe, sales of physical goods, not services (although the data does not always differentiate between the two), represent about 55% of overall B2C e-commerce.

2.4 Actors in the E-Commerce market

E-commerce does not necessarily imply the absence of physical stores but rather an evolution of the way in which retailers fulfil orders. For this reason, E-commerce has led to an increase in innovative combinations of physical and digital solutions such as home delivery, pickup points, automated parcel lockers and other collection methods.

A distinction can be made between Pure Players and multichannel retailing:

- Pure Players are online selling platforms. They include online retailers such as Amazon, Cdiscount, Zalando, or online market places between sellers and buyers such as eBay, Priceminster, Amazon Marketplace, etc. Some of these pure players are generalists (Amazon, Cdiscount) and some are specialists in specific sectors, such as Zalando, which specialises in clothing and shoes.
- Multichannel retailers are mostly physical shops known as click-and-mortar. These are traditional businesses such as Walmart and Auchan, who have launched online services in order to gain a share of the e-retail market.

2.5 Logistics Players in the E-Commerce Market

E-commerce logistics involves four different types of players: National Post Operators (NPOs), Global Integrators, Parcel Carriers, and Last Mile Specialists[4, 6, 9].

2.5.1 National Post Operators

NPO offices are present in every country to fulfil the Universal Services Obligation (USO), which refers to the baseline service provided to every resident of a country. In recent years the postal service has been deregulated: the NPO must satisfy the standards of the national USO but is experiencing more competition. In the parcel sector, competition is keen. Generally, NPOs serve individual countries (e.g. PostNL in Belgium, La Poste in France or Royal Mail in the UK[4]).

Home delivery is generally provided by all NPOs. Similarly, deliveries to work addresses and returns to post offices have almost 100% coverage throughout Europe. The majority of NPOs provide track and trace for both deliveries and returns, and most also allow e-shoppers to return a parcel by handing it in at a post office or a collection point. A smaller number of NPOs allow e-shoppers to arrange for their parcels[4] to be collected for return.

NPOs still retain an important market share of home parcel deliveries in European countries. For B2C shipments, the EU-wide NPO market share is 35%. It is 54% average in countries with good e-commerce performance (UK, Germany, France, Sweden, Finland, Denmark and Netherlands) and 31% average in other European countries[4].

2.5.2 Global Integrators

These companies have a worldwide presence. They are vertically integrated, provide door to door services, and own their fleets of aircraft and trucks[10]. In order to offer an integral service, they also have extensive worldwide networks, enhanced with subcontractors. The main operators in this category are DHL, UPS and FedEx. These companies act as integrators for international shipments, leaving the standard deliveries to parcel carriers companies, or to parcel divisions within the same integrator company (e.g. DHL-Parcel for DHL)[4]. On the European market, DHL (Deutsche Post DHL) is the market leader.

2.5.3 Parcel Carriers

While many studies include this group either within the category of Integrators or Specialists, it is important to clearly distinguish it because parcel carriers, together with the NPO family, represent the core of the e-commerce delivery market in terms of volume. These companies usually cover a regional area, and in many cases are subsidiaries of an NPO, an integrator, or a logistics provider. [9, 11] Their background is in the B2B market, and they are slowly adapting to the B2C market, facing their own capacity constraints and strong competition from NPOs and a wide array of last-mile specialists.

2.5.4 The Last Mile Specialists

This group is composed of small and innovative companies (e.g. the Green Link) providing solutions for urban settings. They cover a local area and are often subcontractors for NPOs or Integrators. They may also be subsidiaries of NPOs or Integrators. They are focused on providing sustainable deliveries using non-traditional vehicles (bikes, cargo bikes, etc.) in an attempt to avoid the negative externalities of transport[9, 11].

2.6 Products in the E-Commerce Market

Clothing and footwear sales generate the largest number of deliveries in today's market and are expected to continue to do so in years to come[12].

According to a study by Barclays (2014), letterbox-sized packages and small parcels (i.e. no larger than a standard UK shoebox) comprised 59.5% of all deliveries from orders made online, with an average growth of 42% predicted between 2013 and 2018.

2.7 Logistics and Delivery of E-Commerce

E-commerce has changed the conventional process of how goods are moved from the seller to the customer. Goods purchased online are delivered by e-commerce transport players, through different logistic schemes (home delivery, pick up points, etc.). This raises concerns regarding the freight flows generated by the growth of e-commerce, particularly in urban areas. Trends indicate that B2C e-commerce for goods is increasing the total number of urban freight movements, and leading to a greater fragmentation of consignments at the city logistics level. It is increasing both the number and frequency of deliveries and decreasing the size of a single delivery.

On the other hand, B2C e-commerce for services has reduced the number of delivery trips by allowing some products to be downloaded electronically (books, music, home entertainment). A statistical estimation of any saving of delivery trips has not yet been made.

2.8 E-Commerce and Urban Freight Traffic

The increasing volume of e-commerce transactions has, in turn, created an upsurge in freight traffic for deliveries to residential areas and office districts previously dominated by personal transport. In 2013, Copenhagen Economics[4] reported shipments of 6,406 million units in the European Union, 56% of them were B2C (3,614 million units), 29% were B2B (1,868 million units) and 14% were C2C & C2B (923 million units). Domestic shipments have a share of 85% (5,429 million units), Intra-EU cross-border shipments of 12% (777 million units) and Extra-EU cross-border shipments of just 3% (199 million units).

This amplifies the conflicts in urban goods movement:

- Logistics service providers try to minimise logistics costs, which are under pressure due to growing demand from shippers for services such as time-specific deliveries, temperature control and regulations.
- Governments are seeking to reduce the negative impacts on environment and quality of life resulting from growth in urban freight transport.

It has been suggested that the expansion of e-commerce may lead to the atomisation of freight flows, increased carrier competition, increased order flexibility (supporting on-time delivery), often with less than a full truck load, at higher frequencies, and with smaller vehicles.

2.9 E-Commerce and Customer Shopping Trips

In Sweden, shopping trips represent approximately 13% of the total energy use for passenger transport, and there are similar metrics in other European countries. However, the impact of e-commerce on personal shopping trips is not homogeneous according to the period and country:

A Swedish survey by Prof. Hiselius on consumer buying and travel habits, based on the travel diaries of regular and non-regular online shoppers shows that:

- On the whole, those who shop regularly online make the same total number of trips as those who do not shop regularly online.
- There is no major difference in individual trips, and no difference in the mode of travel between regular and non-regular online shoppers.

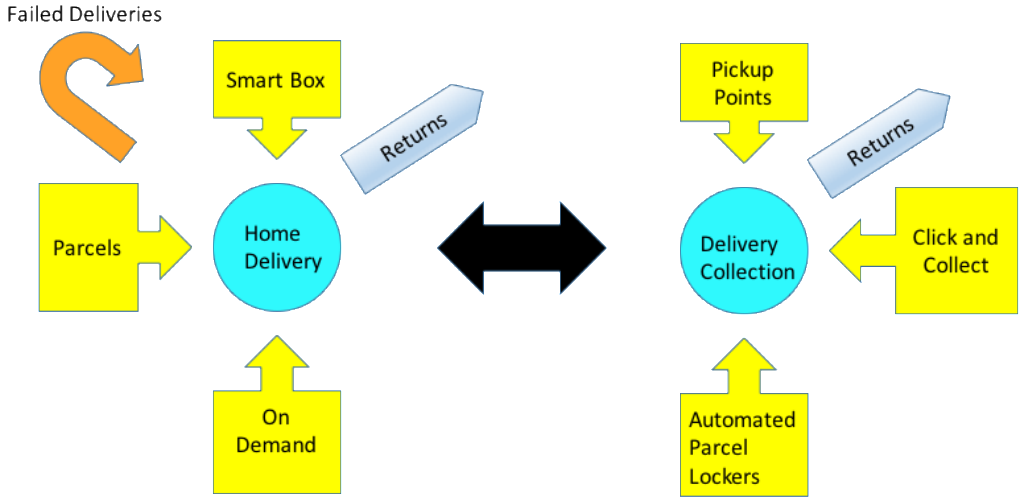
Thus, although a particular shopping trip may be substituted for an online purchase, overall travel behaviour with regard to the total number of trips and trip lengths remains largely unchanged for online shoppers.

Chapter 3 Available Logistics Policy Options for mitigating E-Commerce

Logistics policy schemes are divided in two groups: Home Delivery and Delivery Collection. Home Delivery is composed of Parcel Delivery, Smart Boxes, E-Groceries and On Demand Delivery.

Delivery Collection is composed of Pickup Points, Automated Parcel Lockers and Delivery Collection at Seller Retailer (Click and Collect).

Figure 1 Available Options of Logistics Schemes for E-Commerce



3.1 Home Delivery (HD)

In the decade starting in 2000, the e-commerce market for products ranging from high-value durable goods to low-value consumer goods experienced strong growth as well as sweeping change. The expansion of the market coincided with a surge in direct-to-consumer deliveries. These are referred to collectively as home delivery (HD) [13].

The last mile of HD is currently regarded as one of the more expensive, least efficient, and most polluting sections of the entire logistics chain. This is due to a number of inherent factors. In HD, for example, the security aspect and the associated not-at-home problem must be considered, particularly since it is likely that the addressee may have to sign a confirmation of receipt. This results in high delivery failure and empty trip rates, which inevitably impact substantially on cost, efficiency and environmental performance (cf. emissions). A substantial proportion of home deliveries are performed by vans, which is considered a drawback, since vans have higher emissions per parcel than trucks [13].

Last-mile costs may amount to between 13% and 75% of the total logistics cost[10, 14]. These high proportions are due to inefficiencies such as failed delivery, lack of consolidation, returns, etc. For this reason, the challenges of HD, perceived core business for shippers and couriers, have been thoroughly investigated over the past decade [15-17].

3.2 Pickup Points (PP)

Pickup Points (PP) represent a delivery scheme where customers can choose to receive the goods they have purchased via e-commerce at a specified location, other than their own homes. Goods are delivered to places where customers can collect and even return them if necessary. These can be local stores, the customer's workplace, parcel shops, post offices, urban or micro consolidation centres, etc. (e.g. Kiala/UPS PP in Europe). At a PP, the store personnel manage the collection procedure during opening hours [18].

Customers are generally free to choose the PP from which they would like to collect their parcel. This offers opportunities for trip chaining, as customers can, for instance, visit a PP on their way home from work or on their way from home to a shopping centre[19].

The strength of PPs is the flexibility of opening times, which gives consumers the option to claim their packages at a time that suits them, as well as the lower cost for transport providers compared with home delivery[18].

Consumers can also use PPs to easily return their online order to the sender. Return rates for online orders vary from product to product, but may run as high as 35% for clothing and accessories[19].

For PP, the optimal flow is between 10 and 30 parcels per host outlet, although during peak season, this level is often exceeded.[7]

3.3 Automated Parcel Lockers (APL)

Automated Parcel Lockers (APLs) are groups of reception lockers which are situated in apartment blocks, workplaces, car parks, railway stations, or even on the street. To optimise usage, customers are not assigned their own lockers. The lockers have electronic locks with a variable opening code which can be used for different customers. They may be dedicated to one delivery company (this is the most common situation) or used by several companies. Customers are notified by message when their delivery has arrived, and given the box number and location, as well as the code to open the box.

Customers have three to nine days to collect parcels from the chosen APL. To ensure safety, APLs are generally located in places that can be monitored (e.g. supermarkets, petrol stations). In addition, some APLs are equipped with video cameras and alarm systems.

Customers who collect their parcels from an APL are not bound by store opening hours, nor do they have to wait until the store personnel have time for them. In addition, collecting a parcel from an APL can be done anonymously, since no human interaction is required. However, collecting a parcel from an APL requires knowledge of how to operate it, which may be an impediment for certain customers (e.g. the disabled or elderly)[19].

3.4 Smart Parcel Box (SPB)

An SPB is a box installed at a customer's house, apartment or building. It is a secure parcel delivery and collection system that acts as both a drop box for deliveries and a pickup box for shipping. It keeps packages secure until the recipient can reach them. Some can be shared among many users, providing privacy and safety for each user, and initial investment costs can be shared equally.

The box is built to be weather resistant and strong enough to deal with vandalism. It usually includes an advanced locking system with keypad as well as a manual override lock, and is large enough to receive around 85% to 98% of products bought online. It is fully integrated with a smartphone app so that customers can keep track of deliveries and pickups in real time. Once a package is delivered, customers receive a notification via the company´s app on their smartphone.

3.5 On Demand Delivery (ODD)

ODD is a delivery concept which has been implemented since late 2014 by new start-up companies.[22-26] E-shoppers can order products using apps on their smartphones, and receive their orders at home in less than two hours, delivered by couriers using their own bicycles or cars.[26].

On Demand Delivery (ODD), with its potential for creating a new market, not only disrupts the existing market, but displaces existing technology[27]. ODD includes large companies such as Amazon Prime Now and UberRUSH, as well as start-ups such as Foodora and Deliveroo.

ODD companies supported by their technological platform use an extended network of independent delivery couriers[28], monitor real-time delivery status, and verify delivery to the end customers[25]. By using these services, local retailers can establish home deliveries to serve their urban customers without developing their own technological platforms and logistics solutions.[29]

ODD is a concept being implemented to comply with e-shoppers' delivery expectations[30]:

- Home delivery;
- Fast delivery;
- Low price (although the actual cost may be high);
- Product location real time monitoring;
- Ease of use.

There are two types of operations that On Demand Delivery companies use:

- With companies such as UberRUSH, the customer orders from a retail business and the ODD company handles the delivery in the background[23]. Most customers will not know which delivery company is handling their delivery until after they have checked out and received the text message with a trackable link that says the delivery is on the way [23].
- With other ODD companies such as Postmates or TokTokTok, an ODD app displays retail partners and lets users pick from a menu of items in addition to allowing retailers to use the ODD company for their deliveries [23].

As a variant to the former of the two above-mentioned ODD solutions, crowd logistics has been gaining importance. Hereby, the ODD is not performed by a dedicated logistics operator, but rather by an individual person who is driving on purpose or just because of passing by, this way combining activities in the same trip.

3.6 E-Groceries

Although e-commerce has been rapidly growing as a sales channel for the past decade, reaching and maintaining profitability has sometimes proven difficult. This is especially true for online sales of grocery items, where the specific properties of the products complicate the online selling process. Firstly, many grocery items need to be kept chilled or frozen, which makes

them more difficult to deliver to the customer. Secondly, profit margins in the grocery business are generally quite low, and many online shoppers are unwilling to pay for the convenience of not having to go out to the shop to buy their groceries themselves[33, 34]. Finally, grocery items are generally purchased frequently, which implies that the ordering and delivery process should be as convenient as possible, since the average shopper will have to use these processes many times. Providing this convenience comes at a cost. Together, these properties make the online selling of grocery items a difficult task[35].

In the UK, the offer of e-grocery by traditional supermarkets started at the beginning of 2000, when Ocado and Tesco introduced e-groceries into the UK, followed by all major UK grocers in around 2006. Therefore, the UK can be seen as the European pioneer in e-grocery. At the beginning of 2000, online shopping for food was also marketed heavily in other European countries, however companies encountered more start-up difficulties there. Only two of the 13 e-groceries in France were ever profitable. Explanations suggest both cost-side and income-side determinants[37, 38]. In France, e-groceries are now mainly offered in combination with "Drives" (a click and collect form of online shopping with access primarily by car, also known as click and drive).

In Germany, a revival of e-grocery started around 2009 when Rewe set up a drive-through concept in Cologne. In 2016, a new impetus to the German online food market was added when Amazon announced that they would soon enter the fresh food market in Germany by selling fresh food online. In the US, Amazon is the biggest provider of e-fresh food[38, 39]. In February 2016, Amazon started selling fresh fruit and vegetables in Italy through its Prime Now service. At present, fresh produce can only be ordered online in Milan and 34 municipalities. In June 2016, Amazon UK announced the launch of AmazonFresh for customers in 69 Central and East London areas, with one hour delivery slots[42].

Chapter 4 Features of logistics policy options for mitigating E-Commerce

Logistics Schemes for E-commerce are characterised by the following features, briefly explained in this chapter:

- Failed deliveries,
- Time Windows,
- Returns,
- Density,
- Carbon Footprint,
- Track & Trace, Consolidation,
- Freight traffic in Residential areas,
- Accessibility,
- Logistics Facilities,
- Shift from Personal travel to Freight Transport,
- Delivery Solutions E-Groceries Depend on Customer Habits,
- Institutions and Government,
- Time-Constrained Households and On Demand Delivery

For each scheme, a summarizing thematic box is given summarising the potential need for and impact of the local policy maker on the challenge, the expectations from logistics operators towards local policy makers in respect to the specific challenge, and some illustrating good practices.

4.1 Failed Deliveries

The increasing popularity of online shopping is leading to a growing number of delivery vehicles in residential areas delivering packages to consumers' homes. As home delivery increases so does the number of failed deliveries, because customers need to be at home when their parcel is delivered.

Each failure to deliver represents a substantial cost increase for the last-mile provider.[9, 11, 13, 43] When the consumer is not at home, the courier returns to the terminal and often the next day, or at a time chosen by the customer, the courier will redeliver. After three or four delivery attempts the goods are returned to the shipper, or collected from the terminal by the consumer. This results in additional parcel handling and creates additional costs[44].

The average proportion of failed deliveries is estimated to be between 25% and 30% [45, 46].

PP networks are emerging as one of the solutions for dealing with failed first-time home deliveries.[47, 48] A delivery policy which allows failed first-time home deliveries to be automatically directed to the consumer's nearest PP benefits all parties[47]. In addition, when PPs are located near residential locations (e.g. at local stores), or in areas that already generate consumer trips (e.g. petrol stations, railway stations), little additional travel by consumers will be required to collect a (failed) delivery[49].

Rerouting a failed delivery to a PP also reduces the risk of theft of goods that otherwise would have been left unsecured outside the home or delivered to neighbours. Thus, by using a PP, product loss and insurance claims can be reduced because unsecured deliveries can be mitigated against[45].

In spite of the major investment costs they entail, APL networks seem to be a promising solution, reducing missed deliveries and allowing for off-peak logistics operations[50].

From a societal viewpoint, failed deliveries increase the urban transport distance per e-commerce shipment, resulting in local **air pollution, noise and congestion**. The local policy level has a limited direct impact on the issue of failed deliveries. The logistics industry could develop PP and APL as alternatives for at-home delivery.

Local authorities can stimulate the development of APL through issuing **applicable building permits** in a structured way, by providing at **low cost public locations** to logistics agents, and/or by **promoting APL use** to the residents. The latter can also be made compulsory, but this is most often not a first-best choice from a welfare point of view.

Successful examples are found in Belgium, where bpost deployed lockers at public places (e.g. railway stations); in Germany, where DHL invested in 'Packstations'; and throughout Europe, where integrators as UPS, DPD and DHL developed PP networks, often in cooperation with services like Kiala.

4.2 Delivery Time Windows

Delivery-time windows are specifications regarding the time and hour of parcel delivery to the final recipient or destination. They include the possibility of delivery on the next day, or delivery within a specified time range, or at a precise time (i.e. time definite). Parcel deliveries benefiting from these specified services tend to be more expensive as they set constraints on the optimisation of the network. The higher the number of time-definite parcel deliveries, the more constraints need to be added to the optimisation model and the more difficult it becomes to find optimal solutions[9, 43, 51].

The longer the delivery-time window, the smaller the number of miles per customer travelled[54]. Thus, costs will rise as more and tighter time delivery windows are incorporated into the routing schedule[52]. A study in the greater Helsinki area in Finland identified a cost difference of 42% between home deliveries with reception boxes (without delivery-time windows) and home deliveries with delivery-time windows[53].

The last mile problem is becoming increasingly important for the grocery sector due to the delivery of orders promised within a fixed time window and the perishability of groceries[55-57].

From a societal viewpoint, delivery time windows increase the urban transport distance per e-commerce shipment, resulting in local **air pollution, noise and congestion**. The local policy level has a limited direct impact on the delivery time windows offered by or requested from logistics operators. Logistics operators are impacted on though by vehicle access schemes imposed by local authorities.

Local governments can help by providing longer and more co-ordinated **allowable delivery times** in urban city centres or specific streets. This eases the constraints imposed to logistics operators.

Successful initiatives towards co-ordinated time windows are found in The Netherlands, where it was shown that co-ordinated and less narrow time windows lead to less urban transport vehicles than currently needed which in turn brings more logistics efficiency, lower emissions and better air quality. [78]

4.3 Returns

According to distance selling contracts, consumers can withdraw from a contract, return the product, and be reimbursed. Returns are an intrinsic part of the e-commerce experience,

allowing consumers to return defective or unsatisfactorily purchased goods. Whilst many e-retailers offer a free returns policy with some restrictions, the cost of collecting an item from the customer has to be considered. Like a failed delivery, a return means an extra trip, and additional sorting to deliver the item upstream in the supply chain[9, 43].

ODD companies are launching a service giving their clients' customers the ability to log into their accounts and select, 'I want to return something'. They will see a calendar in the ODD app and be able to choose a day and a time when they want someone to come to their home or office to pick up the return[25].

From a societal viewpoint, returns increase the urban transport distance per e-commerce shipment, resulting in local **air pollution, noise and congestion**. The local policy level has a limited direct impact on the returns policy offered by or requested from logistics operators. Logistics operators are impacted on though by vehicle access schemes and congestion charging imposed by local authorities.

Local governments can help by providing longer and more co-ordinated **allowable delivery times** in urban city centres or specific streets. This eases the constraints imposed to logistics operators, also for returns. At the same time, a coherent **congestion charging policy** by the local authority, which can be passed on in a transparent way to the final customer, can influence the final customer's ordering behaviour.

A successful example is found in Milan, where he first ex-post evaluations of the 2012 CC scheme show a decrease of approximately 18% in the number of freight vehicles entering a charged area compared to the pre-scheme period.

4.4 Density

Higher population density means better logistics performance because it increases delivery density measured by stop per mile. There is an unequivocal declining relationship between mileage per delivery address and the number of consumers in the delivery area per square kilometre. The optimum is between 1150 and 1950 persons per square kilometre[52].

A frequently encountered problem is the lack of penetration of e-commerce (urbanisation vs low demand areas). In consequence, efficiency will be strongly reduced and costs greatly increased.[9, 13, 51] Whatever the delivery cost, the delivery price, mostly determined by the market[9, 58], usually does not vary according to population density.

A solution can be implementing a PP network. Delivery operations in residential areas follow different patterns, mostly because single-home areas seem to accommodate home delivery more easily[18]. The increase in e-commerce has made a denser network of PPs possible[17].

From a societal viewpoint, lower density increases the urban transport distance per e-commerce shipment, resulting in local **air pollution, noise and congestion**. The local policy level has a limited direct impact on the density of population and/or e-commerce orderings. The logistics industry could develop PP and APL as alternatives for at-home delivery.

Local authorities can stimulate the development of APL through issuing **applicable building permits** in a structured way, by providing at **low cost public locations** to logistics agents, and/or by **promoting APL use** to the residents. The remark made in section 4.1 with respect to the negative effects of making APLs compulsory also applies here.

4.5 Carbon Footprint

Consumers recognise that lowering carbon footprint in freight delivery leads to a better environment, however most of them are not prepared to either pay more or wait longer for their goods in return for a greener service[13, 51].

A reduction in consumer travel by car is essential if the environmental benefits of e-commerce are to be realised[59-62]. In the case of complete substitution of the traditional shopping trip (consumer car travel) by van home delivery, vehicle-km can indeed be reduced by up to 70%.[59, 63, 64]

Carbon footprint can also be reduced through the use of environment-friendly vehicles (cargo bicycles, scooters, and electric vehicles).

From a societal viewpoint, a lower carbon footprint reduces **air pollution**. The local policy level has a strong direct impact on the level of emissions, by influencing both the nature and amount of e-commerce trips performed.

As to the nature of trips, local authorities can stimulate or even enforce the use of cleaner vehicles by introducing **low-emission zones**, **diversified charging** according to emission levels, and **promoting the use of cargo bikes**. As to the amount of trips, **congestion charging** and the stimulated use of **urban consolidation centres** can be very helpful. The remark made in section 4.1 with respect to the negative effects of making APLs compulsory also applies here, also to cargo bikes. Urban consolidation centres can also be operated by public authorities, but it is proven that it is better to leave such operations to private operators.

A **successful example** is found in Germany, where it has been identified that the average LEZ decreases PM_{10} by approximately 9% in traffic areas, ranging from 0% for smaller LEZs such as Tübingen to a significant 15% [79] in the case of a more populated LEZ (Berlin with 1.1 million residents).

4.6 Track & Trace

Track & trace services are based on automatic identification of the parcels' location and status via technologies such as radio frequency identification (RFID), barcodes, etc. When parts of the transport component of the delivery chain are outsourced, the subcontracting transportation company usually has the capability to interoperate. Setting up the system requires significant set-up costs. However, after amortization of the investment, savings come from eliminating the operational costs of manual routing, costs of re-routing, communication with the transportation manager to check the location of the driver, diversions, and all other paperwork involved[43].

ODD companies use multi-channel platforms (solutions to support the use of smartphones, tablets, PCs and kiosks) and GNSS-enabled smartphones[32].

From a societal viewpoint, better tracking & tracing increases the urban transport distance per e-commerce shipment, resulting in local **air pollution, noise and congestion**.

The local policy level has a limited direct impact on the density of population and/or e-commerce orderings. The logistics industry could develop PP and APL as alternatives for at-home delivery.

Local authorities can stimulate the development of APL through issuing **applicable building permits** in a structured way, by providing at **low cost public locations** to logistics agents, and/or by **promoting APL use** to the residents. The remarks made earlier with respect to making APL use compulsory also apply here.

4.7 Delivery Consolidation

Delivery consolidation is the opportunity to deliver a large batch of shipments to the same address. B2C e-commerce, serving individual households, has generally reduced the consolidation factor, implying more stops per tour. In the case of On-Demand Delivery companies, there are no delivery tours, as delivery is generally done on a case by case basis, with courier delivery.

Solutions such as PP can provide some degree of consolidation[9]. Delivery companies delivering parcels to PPs offer possibilities for combining the delivery of parcels with the regular supply of goods to the store.

The next step for ODD is being able to combine multiple deliveries into one trip, vastly reducing the cost, by applying the concept of pooling to deliveries. Pooling can include services that allow one company to share the trip and cost with someone else nearby taking the same route[65].

From a societal viewpoint, delivery consolidation decreases the urban transport distance per e-commerce shipment, resulting in less **air pollution, noise and congestion**. The local policy level has a limited direct impact on delivery consolidation. The logistics industry could develop PP and APL as alternatives for at-home delivery.

Local authorities can stimulate the development of APL through issuing **applicable building permits** in a structured way, by providing at **low cost public locations** to logistics agents, by **promoting APL use** to the residents, and by promoting the use of **urban consolidation centres**. The remarks with respect to the performance of publicly operated consolidation centres also applies here.

Successful examples are found in for instance Poland, where it was demonstrated that the implementation and efficient use of APLs benefits from the support of local residents, delivery companies, local authorities and land owners where APLs are planned [21]

4.8 Freight Traffic in Residential Areas

ODD and PP connects demand for delivery and transport services in nearly real time. Couriers are using a variety of transport modes including on foot, bicycles, electrically-assisted cargo cycles, motorbikes, cars and various types of vans and lorries. This can negatively impact on residential areas, traffic management, road safety and conflicts of road users and congestion. The more quickly delivery is demanded, the less efficient the delivery trip will be, and the more freight traffic will be generated in residential areas. Individual shopping trips will be reduced however, and thus emissions could be reduced overall[67] .

Governments need to coordinate actions with the private sector in developing necessary logistics facilities, including local PPs, in order to control the anticipated growth of freight traffic in residential areas due to B2C e-commerce[19].

Some companies, such as DHL in Germany, are testing drones to deliver goods. Amazon is currently (2016) conducting trials in the UK. The trials seek to resolve three major issues:

- How can companies operate drones safely beyond "line of sight"?

- How can drones that can avoid objects be built?
- How can a system be implemented where one pilot is responsible for many drones?

Furthermore, there are still questions about privacy and safety[68].

E-commerce contributes to more freight traffic in residential areas, through dispersion of shipment, leading to more **air pollution, noise and congestion**. Local government can influence the volume of freight traffic in such areas directly and indirectly.

With respect to direct influence, local authorities can introduce **diversified charging** according to the time of day or week. Indirectly, they can **promote the use of cargo bikes, off-hour deliveries and/or urban consolidation centres**.

The higher the level of internet sales, the more parcels are sent. However, according to the US DOT, truck traffic in **US urban areas** has actually declined. The difference in the growth rate can be explained by improved logistics performance, through load rate optimisation, multiple customer deliveries on the same trip, or shorter distances, with the development of sorting centres closer to the city centre.

4.9 Accessibility

The success of PPs is largely determined by their accessibility, and PPs with many consumers in their immediate surroundings generally perform best. A location within walking distance or a five minute driving- distance by car seems to be the critical accessibility value for the success of this concept, and developing a denser network of PPs may stimulate uptake by online shoppers[48] .

PP networks all target the same type of location for new PPs: the most densely populated areas and transportation nodes (main train and subway stations, highway interchanges and road intersections)[69].

An efficient location of APLs in a city is a very important factor for their successful use[70]. Best city locations are:

- Local 'hot spots' within suburbs, next to convenience stores in neighbourhoods with a higher density population;
- High-traffic pedestrian areas in city centres;
- Shopping centres and supermarket car parks;
- Local commuting hubs, bus/subway/rail stations;
- Petrol station forecourts;
- Petrol stations;
- Business centres.

Moreover, a survey conducted among internet shoppers identified that the three most important factors for using an APL were price of delivery, availability and location. Internet shoppers' expectations regarding APL location were: close to home, on the way to work, and availability of a parking space**[20]**.

A **successful example** in for instance The Netherlands[19] shows that the more PP service points online shoppers can reach within five minutes by car from their place of residence, the higher the probability that they will use PP collection/delivery. It appears that people prefer to use this concept when PPs are located close to their homes[19]. In Paris, railway stations are

targeted as priority sites for identifying stores to be added to the PP networks. On average, the population is located 1.6 km from the nearest PP in French urban areas[18]. An assessment of the influence of location on APL efficiency was done in Szczecin, in Poland, in 2012/2013. After relocating five underperforming APLs to new, more suitable locations, it was observed that deliveries increased by 32%. The highest delivery growth was achieved in the case of an APL close to shopping centres.

4.10 Logistics Facilities

The rise of e-commerce comes with an increase in the need for fulfilment centres. Not all e-commerce leads to dedicated logistics facilities (many e-commerce deliveries are integrated into parcel service deliveries, using parcel logistics facilities). However, a substantial number of new facilities have been emerging dedicated to e-retailers.

E-fulfilment centres are mainly based around the major population centres where online sales densities are highest. As online retail continues to grow, the speedy delivery of goods to consumers will, increasingly, provide a competitive advantage.

As explained in previous sections, delivery consolidation decreases the urban transport distance per e-commerce shipment, resulting in less **air pollution, noise and congestion**. The local policy level has a limited direct impact on delivery consolidation. The logistics industry could develop PP and APL as alternatives for at-home delivery.

Local authorities can stimulate through issuing applicable building permits in a structured way, by providing at low cost public locations to logistics agents, by promoting APL use to the residents, and by promoting the use of urban consolidation centres.

Amazon has successfully started to open smaller scale distribution facilities within dense urban areas to offer same-day delivery services. In the UK, the company is beginning with 20 smaller distribution facilities close to major urban areas. Sorting centres are smaller operations that can be located adjacent to or near larger fulfilment centres. By August 2016, Amazon, for its Prime Now service (delivery within less than two hours), had opened more than 35 urban warehouses in main cities in Europe, the US, and Japan.

4.11 Shift from Personal travel to Freight Transport

The majority of shopping trips undertaken are for the purchase of groceries. As such, e-groceries are likely to lead to a shift from personal travel to freight transportation.

Shopping trips represent approximately 1/8th of the total energy use for passenger transport. An average consumer visits a grocery shop 2.2 times a week, and 82% of online shoppers have bought groceries online instead of visiting a grocery store[55]. Customers are reluctant to accept delivery fees despite their negative feelings about the time taken and distance driven to do shopping. This represents a significant drawback for e-grocers who incur costs when delivering products[37].

E-commerce contributes to more freight traffic, through dispersion of shipment, leading to more **air pollution, noise and congestion**. Local government can influence the volume of freight traffic in such areas directly and indirectly.
With respect to direct influence, local authorities can introduce **diversified charging** according to the time of day or week. Indirectly, they can **promote the use of cargo bikes, off-hour deliveries and/or urban consolidation centres**.

In Central London, as a **successful example**, research shows that replacing diesel vans by electric vans and tricycles operating from a micro-consolidation centre would lead to a decrease in total distance travelled and the CO2-equivalent emissions per parcel delivered by 20% and 54%, respectively.

4.12 Delivery Solutions E-Groceries Depend on Customer Habits

There is no 'one-size-fits-all' approach for online food retailing. Consumers in the UK and France shop more regularly for food online than Germans do. Whether this is related to the wider online grocery offer in the UK and France or to consumer behaviour, or is rather a result of both, is not yet clear. Experience to date shows that food shopping via the internet often complements traditional shopping[38]. Differences in consumer behaviour may also be considered: German households spend around 11% of their total consumer spending on food and non-alcoholic drinks, whereas French people spend around 13%. There are also differences with regard to food e-commerce[38].

E-commerce contributes to more freight traffic, through dispersion of shipment, leading to more **air pollution, noise and congestion**. Local government can influence consumer habits in such areas directly and indirectly.

With respect to direct influence, local authorities can introduce **diversified charging** according to the time of day or week. Indirectly, they can **promote the use of cargo bikes, off-hour deliveries and/or urban consolidation centres**.

4.13 Legislation, regulation and permits

Governments will need to draw up new policies, management approaches, rules and regulations for the future, so that all companies can take advantage of new technologies without affecting residential areas and city sustainability.

The EU regulations on the hygiene of foodstuffs (EC) No 852/2004[71] and 853/2004[72] outline requirements for the transport of food, and specific requirements such as Hazard Analysis and Critical Control Point (HACCP) principles. (EC) No 852/2004 requires that adequate transport systems be in place to ensure that food remains safe and suitable for human consumption and delivery.

Even where food is already packaged for transport, requirements differ from those necessary for non-food products. The various products must be treated differently on their way to the end customer, with some products requiring sensitive handling and/or cooling; for that reason, goods have to be packaged in separate boxes. Furthermore, all fresh products need special storage and rapid handling and transport. This increases logistics complexity[38].

APLs are often situated in public spaces, and as a result, it may be more difficult to establish an APL network since a permit from the local authority is often necessary when locating an APL on a public site. Moreover, because of their location in public spaces, APLs are more sensitive to theft of parcels or vandalism[49].

E-commerce leads to more and different freight traffic, resulting in local **air pollution, noise, accidents and congestion**. The local policy level has a direct and indirect impact on the amount and nature of that traffic. The logistics industry develops solutions like PP and APL within the constraints imposed by authorities.

Local authorities can stimulate green, silent, safe and balanced traffic as well as the development of innovative alternatives by the sector through **direct intervention** (e.g. road charging, low-emission zones, etc.) or through **indirect stimulation** (e.g. promoting urban consolidation centres, PPs, APLs, use of cargo bikes, off-hour deliveries, etc.), Furthermore, all other policy-making (e.g. packaging requests, permits to use drones, etc.) is to be developed in the same framework of societal welfare optimisation.
A successful example is found in New York City, where practice in 2009 and 2010 showed that implementing various OHD policies would generate total savings of between $100 and $200 million/year in travel time savings and pollution reduction.[80]

4.14 Time-Constrained Households

Evidence suggests that the more time-constrained households, the more likely they will be to use PPs, APLs, Smart Boxes, E-Groceries or last-minute On Demand Delivery. In addition, the more hours of (paid) work in the household, the lower the likelihood of using Home Delivery, aside from instant home deliveries (for evening dinner for example). This indicates that, particularly for households where no one is at home during work hours, other logistics schemes are good alternatives to home delivery[19]. As a consequence, e-grocers, aiming, for example, at employed parents, place their Drives in business areas to attract customers on the journey between workplace and home.[37] . The mode of delivery, or the last mile issue[56], may be the crucial barrier to e-grocery as a viable business model[36, 73].

Societal welfare does not always benefit from solutions provided in answer to time constraints, through dispersion of shipment, leading to more **air pollution, noise and congestion**. Local government can influence the volume of freight traffic in such areas directly and indirectly.

With respect to direct influence, local authorities can introduce **diversified charging** according to the time of day or week. Indirectly, they can **promote the use of cargo bikes, off-hour deliveries and/or urban consolidation centres**.

In Italy, there are **successful examples** of active UCCs in several Italian cities. Among these, the one in Padua is one of particular interest as an example of EU good practice because it has been in operation since 2004 and has proven to be financially sustainable and successful in reducing adverse environmental emissions.

4.15 On Demand Delivery Couriers

Couriers are not employees of On Demand Delivery Companies, but independent contractors. An individual can register and decide when and how often they want to work.[75] In current ODD companies, most couriers supply their own mode of transport, which may be anything from roller-skates to a motorbike or car.[76] Amazon couriers who deliver parcels for Amazon Flex or Amazon Prime Now are generally not Amazon employees[31], but make use of the app to sign up for shifts and pick up packages from small warehouses near or within metropolitan areas. Legal issues may arise because in some European countries a transport licence is required when using any motorised vehicle (including motorbikes and scooters). For this reason, self-employed couriers not willing to register as freight road hauliers may only use bicycles or other non-motorised modes.

ODD operators often put in place sustainable innovation distribution solutions. The local policy level has a limited direct impact on such solutions.

Local authorities can stimulate innovative ODD by promoting the use of **cargo bikes and urban consolidation centres**.

E-commerce and parcel delivery giants are addressing ODD. Amazon, **for example**, is establishing their ODD service (known as Amazon Prime Now)[31] and United Parcel Service (UPS) has invested in Deliv[32].

The business model of ODD companies is still unclear. Whilst ODD is creating new categories of urban employment, it has led to many unresolved legal issues and, in some instances, poor working conditions. The lesson so far in the on-demand world is that profitability is the exception rather than the norm[77].

Chapter 5 Barriers and Enablers of Logistics Schemes for E-Commerce

There are numerous barriers that policymakers can remove and numerous enablers they can put into place to better accommodate and regulate urban freight transport related to e-commerce. Those are shown in Table 1, divided into six groups.

Table 1 Impact of Barrier Removal and Enablers on Innovative Logistics Schemes for E-Commerce

Category	Measure	Scheme					
		PD	SB	ODD	PP	APL	E-groceries
Laws & regulations	Low emission zones	-	+	-	++	++	-
	Off-hour delivery permission	+	+	++	+	+	+
Infrastructure	Urban consolidation centre construction / building permit	++	+	++	+	+	+
Financial	Congestion charging	-	+	-	+	+	-
	Incentives to supplier	+	+	+	+	+	+
	Engagement in EC projects	+	+	+	+	+	+
	Business model support	+	+	+	+	+	+
Political	Support by higher government	+	+	+	+	+	+
	Integration with passenger transport	++	+	++	+	+	++
Practical and technological	Knowledge & best practice dissemination (cargo bikes, track & trace, cost impact of failed deliveries and returns)	++	++	++	++	++	++
Impact	External stakeholder involvement / communication	+	++	+	++	++	+
	Internal stakeholder involvement / communication	+	++	+	++	++	+
	Monitoring (data collection and analysis)	++	++	++	++	++	++
	Sanctioning (abuse of LEZ, off-hours, congestion charging, etc.)	+	++	+	++	++	++
	Mitigation of side effects	+	++	+	++	++	+
	Publicity for more e-commerce density	+	++	+	++	++	++

Laws and regulations. The main legislative actions that can be taken by a municipal authority are the introduction of a low emission zone on the one hand, and permission for off-hours delivery on the other hand.

Insufficient infrastructure is mainly connected to a lack of sufficient curb space, lack of adequate urban warehouses (fulfilment centres) or delivery areas for loading/unloading activities as well as access to urban areas, which may be problematic due to congestion or narrow roads.

Financial issues can also be a major barrier to the implementation of innovative and sustainable schemes for e-commerce urban deliveries, such as the use of clean vehicles. This motivates a discussion on the importance of finding a business case for each measure that is implemented. Nevertheless, funding is almost always necessary in a starting phase. Congestion charging is another financial regulating system that may be desired. Finally, also joint participation of municipalities and companies in European projects is a way of getting start-up support and building knowledge.

In the *political and cultural category*, the main barrier is that it is hard for local authorities to implement regulations if not supported by their national governments. The lack of interest has been raised, or implicitly mentioned, by many local authorities. This could be explained by several other barriers, such as the "market will solve the problem" or the lack of knowledge expressed as a lack of interest. The lack of interest, as well as many of the other barriers, could be exacerbated by the barrier, "lack of support from politicians and policy-makers in general". Furthermore, also integration of urban logistics policy-making with passenger transportation is important.

When it comes to *practical and technological barriers and drivers*, undesirable side-effects of urban freight measures are a barrier to sustainable urban freight transport. A possible driver is for local authorities to be made aware of workable measures that can be undertaken. For this reason, transfer of knowledge between cities becomes important, to share both successes and failures that could help other local authorities to overcome these barriers. This could also help the local authorities to overcome the barrier of lack of knowledge from their side in terms of how to start implementing a particular measure.

Finally, the *impacts of urban freight transport*, either from specific single measures, or as a whole, act as a clear barrier when it comes to the available data. The barriers are large in this area and the lack of data is noticeable.

Furthermore, for larger cities, the laws and regulations regarding emissions are dealt with by a different department within the authority. Knowledge of how logistics and freight transport work is low, mainly concerning political, cultural, practical and technological factors and impacts. The challenges that arise involve insufficient support from politicians and general policy-makers, inadequate personnel resources, relatively low awareness of possible activities, insufficient knowledge of how to start activities, low awareness of freight transport impacts and a lack of statistics. There are very few cities that have a person dealing with freight transport, and even fewer that have specialised personnel dealing solely with this issue.
Another barrier could be the need for external communication, as well as a lack of sanctioning. Mitigation of side-effects may also be required, as well as publicity for e-commerce solutions so as to generate higher density and hence volume.

Chapter 6 Recommendations

Freight transport in urban areas caused by e-commerce is a business interest. However, the local authority needs to implement regulations and policies which affect the logistics parameter and decision makers, and therefore needs to understand both the cause-and-effect of such measures and how the outcomes could be optimised.

Table 2 summarises the pros and cons of various e-commerce solutions.

Table 2 Summary of pros and cons of E-commerce solutions

Scheme	PD	SB	ODD	PP	APL	E-groceries
Pro	Branding Multi-channel Timing Scale economies	Shared infrastructure	Fast Low price Real-time monitoring Ease of use	Trip chaining Easy returns	Opening hours Easy collection Anonymity	Speedy product
Contra	Cost of operations	Security	Failed deliveries Time windows Density needed	Infrastructure needed	Infrastructure needed	Costly operations

It is important for a city or area to find an appropriate mix of different measures. Governments often struggle to balance the regulation of private firms' activities with the need to leave operating decisions to the firms themselves, so that competition between enterprises can support efficient outcomes. When considering further legislation, rules on competition should be taken into account.

Recommendation 1: In the future, governments will need to draw up **new policies, management approaches, rules and regulations**, so that all companies and cities will be able take advantage of new technologies such as ODD, or delivery using drones, without affecting residential areas and city sustainability.

Recommendation 2: Local authority knowledge and awareness of how logistics and freight transport work as a result of e-commerce should be increased. Three points that emerge as valuable for small and medium-sized cities are:

- An increase in awareness and training to achieve better knowledge of the freight transport area.
- Knowledge transfer and interaction between cities and stakeholders.
- Cooperation with other, preferably neighbouring, cities that have demonstrated the greatest effort in finding solutions to reduce the negative impact of freight transport in urban areas.

Recommendation 3: By adopting an **urban perspective** (transport planning, land use and wider urban planning), in complement to rather than opposed to a transport-system or network approach, planners and local authorities would have a better understanding of how to address e-commerce related freight movements and the implications for their interaction with urban

activities. Interesting in this respect is that the TEN-T framework gives a particular role to urban nodes as part of wider logistics networks.

Recommendation 4: Decision makers need to consider combinations of **data collection** methods so as to identify the best way to tackle the issue in their city. A thorough ex-ante evaluation is necessary in order to make the outcome of the implementation more valuable, as well as to show the actual impacts.

Recommendation 5: Considering an increase in freight traffic in residential areas, together with externalities, policymakers would need to implement measures that make freight activity **more efficient**, for example through:

- Promote **Automated Parcel Lockers** in public spaces.
- Install **loading/unloading bays** in residential areas.
- Increasing the **size of postal boxes** to allow reception of parcels, changing from attended home delivery to unattended home delivery, and obtaining the benefits associated with a reduction in failed deliveries whilst at the same time using the extensive infrastructure of National Postal Operators should also be considered.
- Where helpful, cities can support, as a kind of network manager, logistics operations with open-access infrastructure, for instance urban consolidation centres, tramway and other rail delivery, delivery by water, etc. In that respect, the European Commission's Connecting Europe Facility (CEF) can be of help to make urban logistics projects with a positive welfare-economic balance also have a positive private cost-benefit outcome.
- The increase in ODD services is sometimes leading to an unstable employment status for workers/employees, as the sector often applies maximum flexibility, in line with high- and low-demand moments. **Labour laws** will have to be amended in line with the new requirements. If maximum capacity utilisation of infrastructure is envisaged, also in cities, then legislation will have to cope with e.g. night labour in logistics, etc. This is something that cities do not control themselves, but which they can lobby for, eventually through their national associations, with higher-level authorities.

Recommendation 6: Implementing **Urban Vehicle Access Regulation measures** in residential areas in order to regulate freight traffic is essential. Unsuitable freight transport policies could have a negative impact on the cost and effectiveness of urban freight transport operations. Clear local authority policies on (urban) freight transport are needed.

- The increasing use of **fulfilment centres / urban consolidation centres inside cities** would encourage the use of sustainable methods of last-mile delivery such as walking, using bicycles, motorcycles, or electric vehicles. Support is needed from the local authority's planning department in order to dedicate land for these warehouses.
- Other measures available to policymakers to help reduce the **environmental impacts** of urban freight transport caused by e-commerce include: encouragement of the use of electric and hybrid freight vehicles (with hybrid vehicles switching to a non-polluting power source in the vicinity of sensitive locations such as near schools, hospitals and densely populated areas); and the introduction of lorry routes to keep heavy goods vehicles away from more sensitive locations.
- Controlling the **movement of freight vehicles**. This can be done through for instance delivery time windows, congestion charging, and others.

With private cars delivering goods in cities (crowd-sourced deliveries), tax and charging schemes may need to be reviewed, to allow for the recovery of the externalities caused by cars carrying out parcel/goods delivery.

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