Gaining the next mile in last mile deliveries

A study of the last mile of E-commerce deliveries in the Netherlands

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Preface

As a citizen of Amsterdam, I regularly witness the increasing pressure on the available space in the city. When walking, I am often surprised by how cyclists, pedestrians, vans, trucks, and public transport all share the roads, and by how often this mix works well. In the street near my house, vans and trucks often block the pavements, because stores and restaurants need to be supplied and parcels need to be delivered. Like most consumers, I make many of my purchases online; it is convenient, and most websites guarantee next-day delivery. Nevertheless, sometimes there are three different vans delivering my products, and each van blocks the street for a few minutes. Why are my products delivered by three parties? Could this not be done more efficiently? Recently, and increasingly often, vans have been replaced by cargo bikes or other smart initiatives, but many challenges remain to make deliveries even more efficient. These challenges form the basis of the motivation for this research.

I would like to thank those who made this research possible, with special thanks to all the interviewees and respondents to the questionnaire. I want also to thank my employer, Barentz, who provided me with the flexibility to undertake this research alongside my job. Finally, I would like to thank the Open Universiteit and the guidance of Janjaap Semeijn.

Casper Hondema, Amsterdam, February 23th, 2018
Abstract

The process of city logistics makes an important contribution to the quality of life that people experience in cities. The liveability of cities is under pressure, partly caused by an increase in the number of ‘last mile’ E-commerce deliveries. Various (f)actors involved in the last mile have led to smart initiatives in the sector.

Based on the literature, the following research question has been formulated: How can ‘smart initiatives’ contribute to a more sustainable approach to ‘the last mile delivery’ in urban areas?

To answer the research question, this study employs a case study and various interviews with different stakeholders, such as the web shop Coolblue, the delivery company PostNL, and a professor in city logistics Mr. Walther Ploos van Amstel.

In addition, a survey was used to investigate consumer’s behaviour and vision regarding E-commerce deliveries. This survey serves as a pilot study and is aimed at consumers who make online purchases. The survey was made using SurveyMonkey and was distributed via social media. A total of 114 respondents completed the survey, and 9 interviews with representative of important stakeholders were held, using tools to ensure validity. All the interviews were coded, transcribed, and shared with other researchers to prevent prepossession. The data from the survey were analysed using the Statistical Package for the Social Sciences (SPSS) to ensure statistical reliability.

Focusing on the current situation of last mile delivery in the Netherlands, in terms of emissions, the parcel sector does contribute four percent of total emissions in the city logistics sector. Technical innovations in the automotive industry have contributed to this low figure and led to more sustainable delivery methods. Large delivery companies, such as PostNL and DHL, now often deliver using zero-emission vehicles in city centres.

‘Smart initiatives’ are being put into practice in the form of low- or even zero-emission vehicles. The most important smart initiatives are more difficult to observe, however, because they often concern data about further optimising the process of the last mile delivery. The most important development is address intelligence, which is designed to reduce the number of failed deliveries due to the consumer not being at home. Using the available data, often made available by municipalities, parcel delivery companies can better plan and deliver within a specific time slot, which increases the likelihood of a consumer being at home.
Sustainability, however, consists of more than just CO₂ emissions. Corporate social responsibility is also an important pillar when it comes to sustainability. This pillar not only measures the emission but also the consequences for liveability and economic benefits for stakeholders.

The increase in the number of web shops that deliver their products themselves results in an increase of vehicles competing for road space. Simultaneously, consumers are often unaware of the impact of their chosen delivery method. The lack of cooperation between stakeholders, such as web shops and parcel delivery companies leads to an unnecessary number of vans entering neighbourhoods. These extra vehicles cause disturbances in neighbourhoods such as congestion and noise disturbance. However, many consumers indicated that they are willing to wait an extra day if the delivery impact of their online purchased products can be reduced.

Based on this research, important solutions for city logistics can be found in using urban consolidation centres on the edges of cities. There, goods flows are bundled and then delivered using a zero/low-emission vehicle. Collaboration is needed for this to ensure coordination and thus reduce the number of vehicles. The Government should stimulate and enforce cooperation among stakeholders to move from zero-emissions to zero-impact deliveries!
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1 Introduction

There is an increasing awareness among local policy-makers that urban freight transport contributes to urban problems such as air pollution, noise pollution, and congestion (Cherret et al. 2012; Stathopoulos, Valeri & Marcucci, 2011). Policy-makers, however, face several challenges to deliver more sustainable freight transport in their cities. Urban freight transport is influenced by decisions on mobility, economics, and spatial planning. However, these aspects usually fall within the competence of different government departments, which causes a lack of integration and coordination in policy-making. Furthermore, for a long time, there was a lack of awareness about the importance of urban freight transport (OECD, 2003). Today, the resources made available for urban freight transport planning are limited, which makes it difficult to develop sound policies and to implement measures. Lindholm and Blinge (2014), for example, report that 43 percent of Swedish cities (of which the majority are small- or medium sized) have no one working on urban freight transport, and that only 65 percent of the cities consider it a topic that requires action.

Urban transport via trucks and delivery vans causes congestion in densely-populated areas. Other problems include air quality (which is getting poorer), noise pollution, and a lack of safety (MDS Transmodal, 2012; Taniguchi et al. 2015). In Europe, city logistics is responsible for 25 percent of transport-related CO₂ emissions, and 30 to 50 percent of the remaining transport-related air pollution (PM, NOx, etc.). Within the Organization for Economic Co-operation and Development (OECD), the transport sector is the largest consumer of energy, in general, and of oil in particular (OECD, 2015).

Although the number of freight vehicles is limited, compared with regular vehicles, freight vehicles are relatively more often involved in accidents with pedestrians and bicyclists. City logistics is responsible also for a significant share of the ambient noise in cities, which inconveniences residents at night. The utilisation rate of city logistics vehicles is low. According to Transport for London, for example, delivery vans in that city have an average utilisation rate of about 38 percent. These negative consequences of city logistics have a direct impact on the appeal and liveability of cities (ALICE/ERTRAC, 2015; Ploos van Amstel, 2015).

Many of the negative social-, environmental-, and economic impacts of urban freight transport can be targeted by policy-makers. When attempting to reduce the scale of these negative impacts, policy-makers can implement a range of initiatives intended to alter urban freight operations. Some of these initiatives may only address a single impact, while others could address several impacts simultaneously.
The features of urban freight transport that can be altered to reduce negative impacts are illustrated in Figure 1, together with the negative impacts they are related to. Figure 1 demonstrates that the total vehicle kilometres (and journeys) travelled are the feature of urban freight transport that has the most connections to negative impacts (it is related to all the negative impacts) (Browne et al. 2012).

![Figure 1: Relationship between the features and the negative impacts of urban freight transport](source: Browne et al. (2012))

To keep cities attractive and liveable, public organisations have been using their powers to obtain greater control over city logistics. Restrictions on the use of vehicles (e.g. environmental zones, minimising parking space) or purchasing clean vehicles for their own fleets are examples of gaining more control in the complex field of city logistics. However, a recent study by Balm et al. (2016) suggests that the purchase behaviour of public organisations is not guided by logistics criteria for sustainable and efficient deliveries. This is because the relevant standardised information to support purchasing in sustainable and efficient deliveries is lacking in procurement information systems.

**Urbanisation**

‘Urbanisation’ is a worldwide phenomenon. People continue to move from the countryside to urban areas. This situation impacts the liveability of cities, since we need to share the same space with even more people. This research focuses on the Netherlands. People from rural regions in the north and east of the country continue to move to the most highly urbanised areas of the Netherlands in the west of the country, commonly referred to as the ‘Randstad’. The Randstad includes the country’s four largest cities: Amsterdam, Rotterdam, Utrecht, and The Hague (PBL, 2015). The world’s urban population is expected to double, from 2.6 billion in 2010 to 5.2 billion by 2050 (Crosssette et al. 2011). Rising urban populations increase pollution caused by carbon dioxide, greenhouse gases (GHG), and traffic jams, which impacts the liveability of the city.
**Change in consumer behaviour: E-commerce**

In the past two decades, the growth of online shopping by consumers has led to a strong rise in the number of parcels shipped to consumer homes. Twenty years ago, these same goods would have been bought in shops. The percentage of articles purchased online ranges from 5 to 90 percent, depending on the type of article (Javelin Group, 2011; Cushman & Wakefield, 2013). This change has led also to a growth in parcel volume (Weltevreden and Rotem-Mindali, 2009; Ducret and DeLaitre 2013; Rotem-Mindali and Weltevreden, 2013). This development has resulted in an enormous challenge due to the increase of freight and commercial transport. As mentioned previously, the growth of urban deliveries has negatively impacted liveability in urban regions. The Dutch website logstiek.nl, a website for news, information, and recent developments in logistic-related subjects, reports that, in Amsterdam, the expectation is that within 10 years the daily number of packages will increase to more than 100,000. Even though this growth in the number of packages will hardly increase the number of vans, one development that is already leading to an increase in the number of vans is web shops that deliver products themselves, using their own vans.

In addition to the change in consumer behaviour and the development of urbanisation, city logistics concerns several stakeholders plus local infrastructure and recent developments in technology, all of which must be considered. All these factors make city logistics complex. In this thesis, we describe this complexity and research how to improve sustainability, especially concerning ‘last mile delivery’.

**The last mile in city logistics**

Within the field of city logistics, a commonly-used concept is ‘the last mile’. This term is used to describe the movements of people and goods from a transportation hub to their final destination. Often, many organisations extend their supply chains to retailers, but do not focus on the last mile. This is largely because the last mile is overlooked due to its distance from the place of planning (Clausen et al. 2016).

Regarding concepts for achieving sustainable city logistics for the last mile, the most obvious actions are the consolidation of transport and alternative modes of transport. Both options are enabled by transshipment in urban consolidation centres (UCCs) (Allen et al. 2007).

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As illustrated in Figure 2, the idea of UCCs is to separate distribution into activities inside and outside the city. One of the main arguments for transshipment points at the city border is to benefit from the advantages that large vehicles used for long-haul transport outside the city provide, without having their disadvantages in the urban area, such as pollution, inconvenience, and traffic safety risks (Clausen et al. 2016).

Moreover, transshipment at the consolidation centre allows for the use of more sustainable means of transport (described in this thesis as ‘smart initiatives’) in the city (e.g. hybrid and electric vehicles or cargo bikes) (McKinnon et al. 2015).

![Figure 2: Impact of the UCC concept on the distribution of goods](source: McKinnon et al. (2015))

The contribution UCCs make to a more sustainable last mile delivery is more than simply reducing CO₂ emissions, there are also fewer GHG emitted, improved traffic safety, and reduced congestion. All these factors are important for making last mile delivery more sustainable and improving quality of life.

What we have discussed so far leads to the following main research question:

**How can ‘smart initiatives’ contribute to a more sustainable approach to ‘last mile delivery’ in urban areas?**

To answer this, the following research sub-questions have been formulated:

1) What is the current situation of ‘last mile delivery’ in the Netherlands?
2) Which smart initiatives are being used in ‘last mile delivery’?
3) What is the contribution of ‘last mile deliveries’ to sustainability in terms of emission and social sustainable cooperation in the Netherlands?
1.1 Research method

This research contains a case study of the ‘last mile’ within the field of city logistics. The focus is on the Netherlands, and more specifically, the situation in the Randstad, the most densely-populated region in the country.

Semi-structured interviews were held with different stakeholders, for example, start-ups, existing parcel delivery companies, and local authorities, such as the municipality of the concerned city. In addition, a survey was held among consumers to investigate their behaviour and vision regarding E-commerce deliveries. The differences in existing infrastructure provide different opportunities for making the last mile more sustainable. In Amsterdam, with its many canals in the city centre, deliveries by water are a possibility; while in other cities, without such canals, different approaches must be used. The methodology of this research is described further in Chapter 3.

1.2 Thesis structure

The first chapter of this thesis discusses the background and motivation for this study. Furthermore, the main research question, research sub-questions, and research methodology are described also. Chapter 2 contains a review of different theoretical concepts in the literature, from which the resulting research model was developed. Chapter 3 discusses the research design, data collection, operationalisation, data analysis, and methodological issues. Chapter 4 describes the results of the study. Finally, Chapter 5 contains the conclusions based on the results, followed by a discussion and recommendations for practitioners and for further research.
2 Literature review

This literature review contains an approach that can be described as an explanation from ‘problem to solution’. First, we describe the term ‘urban transport’, also known as city logistics, and what is known about urban transport in the different fields of science. When was the topic of city logistics first studied? This is described using a brief historical perspective. After describing the history of the subject, we focus on the current situation: How can we evaluate the situation in the Netherlands, and what is the process of delivering parcels? Then, the focus shifts to those companies that organise their own deliveries. These are described using some relevant examples. From the present situation, we move to the complexity of this subject. This complexity is partly caused by the number of stakeholders involved. Finally, we present the suggested solutions for addressing problems in the last mile. The last mile requires a more sustainable approach. We focus on the term ‘sustainable’ by using the triple ‘P’ bottom line (3P) (Elkington, 1994) to describe sustainability and the role of the different stakeholders.

2.1 City Logistics: A complex subject since the late seventies

The first formal definition of urban transport, according to Ballantyne et al. (2013, p. 94), was formulated by Hicks (1977), and is as follows: ‘all journeys into, out of, and within a designated urban area by road vehicles specifically engaged in pick-up or delivery of goods (whether the vehicle be empty or not), with the exception of shopping trips’. Several definitions followed, with varying degrees of detail and vision, for example, Ogden (1992), Taniguchi et al. (1999), Allen et al. (2000), Quak and de Koster (2006), and Dablanc (2008).

In the past few decades, the subject of mobility, and more specifically urban transport, has gained attention, both in the field of research and in a wider political and policy context. Bektaş et al. (2015) mention that urban transport, which is part of city logistics, can be divided into two sections: people-based transport and freight-based transport. People-based transport has developed well in terms of multi- and intermodal public transport (e.g. buses, subways, taxis, and trains), particularly in large cities, but this is not the case for freight-based transport.
Discussions have revolved around whether or not to include elements such as service transport and through freight traffic, but a common conclusion from the authors discussed above is that shopping trips by household private cars should be excluded from definitions of urban freight. (Dablanc, 2008)

Taniguchi et al. (2001, p. 105) define city logistics as ‘the process for totally optimizing the logistics and transport activities by private companies with support of advanced information systems in urban areas considering the traffic environment, the traffic congestion, the traffic safety and the energy savings within the framework of a market economy.’ The definition by Taniguchi (2001) offers a good idea of the motive for conducting research in this field, since city logistics majorly impacts the environment and liveability.

**Complexity of city logistics**

The number of various definitions and visions concerning urban freight and city logistics underlines the complexity of this field. This is also the reason there is a lack of consensus on how to address this issue. Based on the articles used in this thesis, one thing is certain: The interest and studies that focus on the field of city logistics are very divergent. The most common studies are in the field of ‘social science’, ‘political science’, ‘urban economics’, ‘spatial planning’, ‘transport research’, and ‘technology’.

The variety of studies illustrates the complexity of this subject and the different approaches used to research it.

This variety leads to several perspectives that focus on the ‘problem’ of urban freight. These perspectives, which were found in the existing literature, focus on policies and (local) government, ‘big data’, information and communication technology (ICT), technology, urban geography, and sustainability.

Different perspectives mean different mindsets and approaches about how to address this ‘problem’. The most common approaches in the literature are the ‘system thinking approach’ (Kunze, 2016); the ‘Delphi method’ (Kauko and Palmroos, 2014; Keil et al. 2013); and the ‘triple helix model’ (Etzkowitz and Leydesdorff, 1995).

Although the visions and the fields of study differ greatly in almost every article, the influence and the interdependencies of different stakeholders and actors are a recurring issue.
2.2 City Logistics: The present situation in the Netherlands

Having broadly described the history and the complexity of city logistics, we now focus on the present situation. The process of parcel delivery is described, as is the impact of these deliveries in terms of pollution (e.g. GHG).

Though the focus of this thesis is the growth of E-commerce and the consequences of this growth on city logistics, especially for last mile delivery, the present situation in the Netherlands does not directly cause alarm. A recent study by Connekt, the Dutch public-private network for sustainable mobility, presented some hard data on the subject during a recent conference (March 2017) on the Dutch logistics sector.

With almost one million delivery vans currently in use in the Netherlands, only two to three percent of those delivery vans deliver parcels to homes and offices. The total amount of pollution from GHG from parcel and delivery express compared with other components in city logistics is relatively low – around four percent currently. In Figure 3, the division of GHG pollution in the sector is illustrated.

![GHG related to city logistics](image)

*Figure 3: Pollution of GHG related to city logistics  Source: Connekt (2017)*

Despite the number of vans used for parcel deliveries being relatively low in comparison with the other fields of delivery, different issues, inefficiencies, and externalities affect the industry, particularly in the last mile segment (Perboli et al. 2014). For example, when examining the situation in the Netherlands, there are different parcel delivery services involved in the last mile. Large companies such as DHL, TNT Express, and FedEx make the most deliveries. However, the past few years have seen an increase in the number of web shops that deliver their own goods and that have begun their own delivery services (e.g. Coolblue, Foodora, Deliveroo, and the online grocery PicNic). This means that the number of delivery vans in city centres is higher than necessary.
There is, too, the challenge of return logistics: due to the high number of delivery ‘failures’, a second delivery, or even more attempts, are necessary. The urgency to promote smart and zero-emission city logistics is growing. City logistics is becoming more finely meshed and more frequent (Taniguchi et al. 2015). The narrow streets in Dutch city centres are not designed for the continuous flow of delivery vans and trucks. This excess flow of traffic directly impacts the appeal and liveability of these cities (ALICE/ERTRAC, 2015).

The process of parcel deliveries

In the past decade, the E-commerce market has grown rapidly, especially with business-to-consumer (B2C) deliveries (Gevaers et al. 2011). Combined with the problem of failed deliveries (at the first attempt), this provides extra work for parcel services at a time when this work should be reduced in a competitive market to lessen the impact on the accessibility and liveability of urban regions. The regular distribution process is illustrated in Figure 4. The order is collected at the shipper and transported to a nearby terminal (departure terminal). Then, the goods are transported by truck to another terminal (arrival terminal), and then the last mile parcel delivery is made in which ‘the last mile is the last stretch of a business-to-consumer (B2C) parcel delivery to the final consignee (consumer) who must take reception of the goods at home or at a collection point’ (Gevaers et al. 2009).

![Figure 4: Framework of the parcel delivery process](Source: Gevaers et al. (2009))

When the consumer is not at home, the courier returns to the terminal. Usually, the next day, or a at a customer chosen delivery time, the courier tries to deliver again (red processes in Figure 4). According to the literature and different studies focused on city logistics, the process of delivery can be divided into three main streams: an approach based on operation management and optimisation models; an approach based on sustainability issues; and an approach based on emerging business models (Peroli et al. 2017).

Urban freight transport is not only essential for the growth of the (local) economy, but also for a better city environment. However, several studies have suggested that the impact of pollution on liveability and safety is becoming greater. Web shops increasingly often different delivery methods, which makes the process of package deliveries even more complex. Various studies, such as the study of EY (2015) and UPS (2017) have investigated the consequences of different delivery methods and the impact of e-commerce deliveries in terms of emission and consequences for the quality of life in neighbourhoods.
Therefore, there is increasing awareness and knowledge among policy-makers of the need to change how the last mile is handled. Balancing smart economy growth with cleaner, quieter, and safer communities is needed. In the next section, we discuss the problems and the solutions concerning the last mile.

2.3 Aspects of problems and solutions

Many cities worldwide face problems of congestion, low-quality air, environmental degradation, and accidents (Cheba et al. 2015). These problems contribute to premature mortality, sleep disturbance, and disability, and they also negatively influence the effects of climate change (Browne et al. 2012).

According to the literature and studies on city logistics, a common conclusion concerns the role of stakeholders and other actors and their interdependency (Ballantyne et al. 2013). Since these stakeholders have different objectives and different interests in urban freight transport, coordination among them is required to create more sustainable and liveable cities (Taniguchi, 2014).

In the literature there are various classifications of stakeholders involved in the field of city logistics. Most classifications relate to urban freight transport (Ogden, 1992; Muñuzuri et al. 2012; Taniguchi and Tamagawa, 2005; Russo and Comi, 2011; Anand et al. 2012; Ballantyne et al. 2013; Lindholm, 2014). According to the definition of city logistics developed by the author, six stakeholders can be distinguished: local authority, residents (consumers), shippers, receivers, transport companies, and public transport operators. In this study we do not focus on the role of public transport operators, but rather on urban freight transport and the process of last mile delivery.

Each of the stakeholders has a different approach, expectation, and need in terms of city logistics (Stathopoulos et al. 2012; Muñuzuri et al. 2012; Balm et al. 2014; Lindholm, 2014). These differences are due to different stakeholder having various interests and, furthermore, some stakeholders having political power with respect to freight movement within cities (Stathopoulos et al. 2012). One of the most significant stakeholders is the local authority, whose main purpose is to improve the quality of life of residents. Public authorities are also responsible for planning, organising, controlling, and improving policy measures (Taniguchi et al. 2014). Then, there is the expectation of the shippers. Their main target is to satisfy customer needs by providing goods at the lowest cost.

The aim of the customer (or receiver) is to obtain their products at the right time and place. Transport companies expect to meet the needs of shippers and receivers by providing high-quality and effective transport services (Kiba-Janiak, 2016). Finally, there are the residents, who expect an efficient and accessible city with a high quality of life (Tubis et al. 2014).
When examining the differences between stakeholders, the following question arises: What is the solution for obtaining synergy for the main targets of city logistics – mobility, sustainability, and quality of life – when each stakeholder has different expectations and interests? According to Taniguchi et al. (2014), building partnerships and consensus between stakeholders is extremely important for implementing city logistics projects in terms of the different expectations of stakeholders. The study by Taniguchi et al. (2014) demonstrates that there are three major elements essential for promoting city logistics: 1) The application of innovative technologies of ICT and intelligent transport systems (ITS); 2) A change in the mindsets of logistics managers; and 3) Public-private partnerships.

Since several stakeholders are involved in the field of city logistics, it is difficult to satisfy all them, and it is not possible to implement solutions that are successful for everyone (Balm et al. 2014) in a long-term partnership (Kramarz and Kramarz, 2012). Nevertheless, these solutions can have a positive effect for all stakeholders in the future (e.g. in relation to partnerships between local authorities and private companies (Lindholm and Brown, 2013)). Studies have demonstrated (e.g. Ballantyne et al. 2013; Kiba-Janiak, 2015) that public-private partnerships are important, since discussing and meeting together are necessary for finding smarter solutions and implementing them in real situations.

‘In the case of city logistics, it is difficult to identify the critical success factors that would be equally important for all stakeholders’ (Taniguchi, 2014). Several studies have conducted research into the opportunities for innovation in city logistics, especially concerning last mile delivery. Two of these studies are described in the following section.

**The triple helix model**

Research in the past focused only on the public and commercial stakeholders involved in city logistics. Bergqvist (2007) highlights the importance of public-private collaboration in a triple helix context. That is, 1) research institutions, 2) industry, and 3) local authorities, such as municipalities and public organisations. The concept of a triple helix of university-industry-government relations was initiated in the 1990s by Etzkowitz (1993) and Etzkowitz and Leydesdorff (1995). These relationships are an important factor in guaranteeing the successful implementation of innovative urban freight concepts (Verlinde, 2016). Each stakeholder has its own dynamic, and therefore the objectives of public and commercial stakeholders often conflict. In practice, the triple helix model has been used as an experiment in several European cities (Verlinde, 2016).
Figure 5 illustrates the setup of the Mobile Depot trial in Brussels from a triple helix perspective (Verlinde, 2016)

![Figure 5: Setup of the Mobile Depot trial in Brussels](Source: Verlinde (2016))

**Delphi method: SLIM-PREF**

Stakeholders often differ in their interests, and therefore it is important to identify the key success factors for different stakeholders. In line with the triple helix model, the study of Kiba-Janiak (2016) makes an important contribution by using ‘SLIM-PREF’, which is based on the Delphi Method (Cafiso et al. 2013; Geist, 2010). The main purpose of city logistics is to improve sustainability, liveability, and mobility (Taniguchi et al. 2003) by implementing various activities. The main purpose of using the SLIM-PREF model is the identification of key success factors for city logistics and their importance from the perspective of various groups of stakeholders (Kiba-Janiak, 2016).

SLIM-PREF stands for **Strategy and operations**, **Logistics infrastructure**, **Innovation and ideas**, **Marketing**, **People**, **Regulations**, **Environment**, and **Finance**. The model focuses on the various key success factors for different stakeholders. Analysing this model and the key success factors can contribute to a better understanding of stakeholder expectations in terms of the flow of goods (Kiba-Janiak, 2016). The model is a tool for strategic analysis by local authorities, shippers, and transport companies, and makes it easier to satisfy stakeholders, which is necessary for implementing innovations.
Different theoretical research has been discussed in terms of solutions and facilitating innovations in city logistics. However, solutions must be tested in practice. Therefore, it is important to work together within the field of applied research. Applied research differs from classic theoretical research in that it investigates practical issues in the field and involves close cooperation with professional practice (Ploos van Amstel, 2015).

Several initiatives have been tested, or are still being used in practice, some of which are discussed in the following section.

**Solutions for last mile delivery: ‘Smart initiatives’ in practice**

Appendix 1 provides an overview of ‘smart initiatives’ used in last mile delivery.

**The role of local authorities in improving last mile delivery**

There is an important role for local-, national-, and international authorities in regulating, coordinating, facilitating, and stimulating improvements in city logistics (MDS Transmodal, 2012; Vlaamse Ministerie van Mobiliteit en Openbare Werken, 2013; Quak et al. 2014). Quak’s dissertation (2008) provides an overview of important Dutch initiatives and the reasons not every initiative proved successful.

There are several reasons not all the initiatives were successful. According to Ploos van Amstel (2015), the main causes are: 1) initiatives were developed based on the wrong data about city logistics; 2) the proposed solutions were unattractive to customers; 3) the solution was too expensive compared with the existing situation; 4) the business model for city logistics was not sound, meaning a critical mass was not achieved; and 5) the town council and local political situation proved volatile since it changes every four years.

Quak et al. (2014) underline the lack of business models in city logistics. When new initiatives are implemented there is no clear business model, and therefore they do not generate money. Many initiatives in city logistics are started with government subsidies. When this funding stops, it often means the end of an initiative. In recent years, much knowledge has been gained on the impact of city logistics on the environment (e.g. congestion and pollution), the health of residents, and city safety. However, there remains much room for improvement.

A common statement is that city logistics must be more sustainable. In the next section, we discuss sustainability.
2.4 Understanding and evaluating sustainability in the last mile

Though many definitions of sustainable and sustainability exist, Behrends et al. (2008) refer to the term ‘sustainable development’. After defining the term ‘sustainable development’, the focus shifts to sustainable transport, or more specifically, sustainable urban transport. May et al. (2001) define the term ‘sustainable urban transport’, based on the general principles of sustainable development, using six sub-objectives. These sub-objectives are part of the 3P bottom line (Elkington, 1994), which includes the concepts of People, Planet, and Profit. These concepts should be combined in a harmonious way to achieve sustainable development.

Together, the terms ‘sustainable development’ and ‘sustainable urban transport’ have many interfaces, and these are described in Figure 6 (Behrends et al. 2008).

Thus, sustainability is a term with several meanings. Sustainability is not only about the environment, but also covers economic and social sustainability. Several solutions in making city logistics more sustainable are discussed in the following sections.

Energy-saving technologies

Technological innovations in vehicle design offer high potential for a more sustainable approach in urban freight, since energy savings can be achieved by using low-energy and low-emission vehicles (Taniguchi et al. 2015). These new vehicles, as described in the previous section concerning initiatives in last mile delivery, have been introduced by some operators for transporting goods in urban areas, and are green in terms of their fuel sources (e.g. electricity or liquid natural gas) (Browne et al. 2012).
**Low-emission zones**

Several cities in Europe have implemented low-emission zones (LEZ), also known as environmental zones. These zones can only be accessed by vehicles meeting a minimum of Euro 4 engine standards. Several studies have conducted research into the effects of these zones. Although these zones have a positive effect on air quality, the results are lower than expected (Browne et al. 2012). A recent study on the effects of LEZ in German cities, and their effects on air pollution and the health of infants (Gehrsitz, 2017), demonstrates that in areas that have LEZ, the reduction of pollution was more pronounced than in surrounding areas. However, the same study also announced that there are no signs that, due to drivers circumventing these LEZ, the level of pollution increased in surrounding areas. Browne et al. (2012, p. 27) came to the same conclusion in their study, claiming, ‘Although these zones have a positive effect on air quality, the results are lower than expected. Reasons for this include that new vehicles are less clean than was expected, and a lot of older vehicles can still access these zones because they have been given a permit to do so.’

**Urban consolidation centres**

Many of the articles used in this literature review concern UCCs. These centres are described in the introduction, along with their key role in many initiatives to make city logistics more sustainable. These UCCs are usually introduced by local governments to reduce the number of motorised freight vehicles entering their cities. In a UCC, freight from different carriers is bundled together, and could make last mile delivery more efficient since smaller vehicles (such as low-emission vehicles) can be used.

Van Heeswijk et al. (2017) researched the optimisation of a UCC in Copenhagen. The main reason to optimise the use of UCCs is that practice has demonstrated that most UCCs have only a short lifespan (Browne et al. 2005) because of their strong reliance on funding and subsidies from local government.

Therefore, the goal of the study by van Heeswijk et al. (2017) is to identify schemes that, following a period of funding, agents can continue to operate in a sustainable manner, while simultaneously yielding substantial environmental improvements. Hence, it is important to work on UCCs that are ‘future proof’ and are economically and environmentally sustainable in the longer term.
2.5 Research model

In this study, the complexity of city logistics plays an important role in making the last mile more sustainable. Within the ‘chain’ of complexity, several (f)actors are involved. Collaboration between stakeholders is needed to create solidarity. Furthermore, there are factors such as city infrastructure and technology that play an important role. Does the available infrastructure and technology support the stakeholders by enabling their insights? Stakeholders can influence these factors by using them in a corrective way or investing in infrastructure and technology. External factors, such as the political stability or geographical situation of a country, influence what is possible in the chain between stakeholders and infrastructure. In Figure 7, the research model is illustrated.

![Research Model Diagram]

Figure 7: Research model  Source: author
3 Methodology

The literature reviewed in the previous chapter serves as the basis for this study and led to a conceptual model. The role of stakeholders is important in the field of city logistics. However, as pointed out in the literature review, there are major differences in the visions and interests of stakeholders. To better understand these differences, stakeholders form a large portion of this study.

3.1 Research method

To answer the main research question, an exploratory study was performed. Data were collected using a combination of qualitative and quantitative approaches. To determine which research strategy is appropriate, two factors are important: the aim and the complexity of the research (Yin, 1994). The aim of this study is how to evaluate sustainability in the last mile of E-commerce deliveries.

Regarding the complexity of this study, we needed to collect data from several stakeholders that have different interests and different visions about sustainability. These differences stem from various interests and the different political powers of stakeholders (Stathopoulos et al. 2012). Since multiple stakeholders are involved (e.g. parcel delivery companies, web shops, and start-ups), interviewees were chosen to represent most of these parties. Individual in-depth interviews made it possible to discover shared understandings. This was important for the research at hand, as not all factors had been thoroughly covered by the literature. In addition to the interviews, a survey was conducted to involve the consumer in this study to investigate their behaviour and vision compared with E-commerce and delivery methods.

3.2 Data collection

3.2.1 Semi-structured interviews

From September 2017 to December 2017, several semi-structured interviews were conducted. A broad range of stakeholders involved in the field of city logistics, E-commerce, and the last mile delivery process were interviewed. Logistic service providers and large E-fulfilment parties positioned between customers and E-retailers were included for their knowledge of the logistics market.

Furthermore, consultants and researchers with close ties to city logistics and E-retailers were interviewed as ‘experts’. Unfortunately, the local authorities (e.g. municipalities) did not participate in the interviews, either because it was difficult to meet key informants or because of a lack of time.
Respondents were approached via LinkedIn or e-mail. During the interviews, suggestions were made by respondents to meet other key informants, by providing their direct phone number or e-mail address. Prior to the interviews, the respondents received a topic list to prepare for the interview. These topics have come about as a result of the literature review and deal with (the lack of) cooperation between stakeholders, the role of (local) authorities and practical examples when it comes to ‘smart initiatives’.

The interviews were conducted in face-to-face meetings or via a telephone call. During these interviews, the respondents were asked if they agreed to being recorded, which all did. During face-to-face interviews, the application ‘Voice Record’ for iOS was used. For interviews on the telephone, the application ‘Tape a Call’ for iOS was used. Both applications generate an MP3 audio file. The length of the interviews varies between 24 minutes and 79 minutes. Below is an overview of the companies the interviewees worked for.

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Field of work</th>
<th>Length of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert Heijn</td>
<td>Grocery</td>
<td>28 minutes</td>
</tr>
<tr>
<td>EY</td>
<td>Consultancy</td>
<td>39 minutes</td>
</tr>
<tr>
<td>Hogeschool van Amsterdam</td>
<td>Education / Research</td>
<td>61 minutes</td>
</tr>
<tr>
<td>Parcel4Me</td>
<td>Start-up IT / E-commerce</td>
<td>79 minutes</td>
</tr>
<tr>
<td>PostNL</td>
<td>Post / Parcel delivery</td>
<td>64 minutes</td>
</tr>
<tr>
<td>Sandd</td>
<td>Post / Parcel delivery</td>
<td>39 minutes</td>
</tr>
<tr>
<td>BuurtMus</td>
<td>Start-up E-commerce</td>
<td>24 minutes</td>
</tr>
<tr>
<td>Coolblue</td>
<td>E-commerce</td>
<td>40 minutes</td>
</tr>
<tr>
<td>2Dok Den Haag</td>
<td>City Logistics</td>
<td>53 minutes</td>
</tr>
</tbody>
</table>

To make the interviews useful for further data analysing, all the interviews were transcribed. Then, they were shared with the respondents to check whether the interviews had been processed accurately. By recording and transcribing the interviews, as well as asking for verification when points were unclear, reliability is improved (Yin, 2009). Respondents also had the opportunity to indicate whether certain information should be omitted due to privacy or company-sensitive information they did not wish to divulge in this thesis.
3.2.2 Survey

Although this study has a largely qualitative approach, it proved valuable to add a quantitative approach to the process of data collection. This approach involved the consumer in the study.

In the process of last mile delivery, the consumer is also an important stakeholder. However, the data for this specific type of 'stakeholder' cannot be analysed using interviews, because there is a difference between each consumer and their behaviour and vision regarding E-commerce (deliveries). Therefore, a questionnaire was created, which contains 16 questions, including multiple-choice and open questions. This survey serves as a pilot study, where the questions are based on previous studies (such as the study of EY, 2015 and UPS, 2017). Main purpose of this survey is to gain insight into considerations (such as the choice in delivery methods and willingness to pay) made by consumers and their vision against the process of their E-commerce deliveries in terms of impact.

The website SurveyMonkey was used to create this survey. September to November 2017 was the period available online to collect data. A total of 135 consumers took part in the survey, 114 of whom completed the entire survey.

Since this study concerns the Dutch market, only Dutch people were approached for the survey, and therefore the questions and answers are in Dutch. An overview of all the survey questions, including an English translation, is in Appendix 3.

The respondents consist of friends, family, colleagues, and acquaintances who were directly approached by mail or by a link on Facebook and LinkedIn.

At the end of November 2017, the results were exported into an Excel document so the data could be analysed using SPSS, version 25.

3.3 Operationalisation

Based on the theoretical framework described in Chapter 2, theoretical concepts were chosen that serve as the basis for this research. These concepts were used as major topics during the preparation of the interviews and the survey, and covered subjects such as the complexity of stakeholders, the future of last mile delivery, and evaluating the sustainability of last mile delivery.
3.3.1 Interviews

The interviews led to a large amount of transcribed text. Therefore, to provide an overview, the subjects in each interview are categorised. These categories are 'data-driven', which means that categories emerge based on the collected data. Miles and Huberman (1994) advise using data reduction. This reduction is done by coding and categorising the interviews. The process of coding consists of three steps: 1) 'open coding', 2) 'selective coding', and 3) 'axial coding'. During the process of coding, citations from each interview are used. The process began by coding the interviews with Walther Ploos van Amstel (professor in city logistics) and with PostNL. These two interviewees are important because of the knowledge and research of Walther Ploos van Amstel, and because PostNL are the largest logistics service provider in the Netherlands. The subjects in both interviews covered common themes that were used for analysing the remaining interviews. In Appendix 2, the coded interviews of Walther Ploos van Amstel and PostNL are illustrated in a 'data matrix'.

3.3.2 Survey

Redistribution of groups

In some groups (e.g. age and education level) the number of respondents was low, which makes it difficult to substantiate them statistically. Therefore, the decision was made to redistribute these groups by combining two groups. After redistributing the groups for the factor 'Age', three groups remain: up to and including 34 years old, 35 to 55 years old, and 55 years and older.

After redistributing the factor 'Education level', again three groups remain: Middelbaar onderwijs + MBO, HBO + Bachelor Universiteit, and Master Universiteit + PHD.

Likert-scales

In the survey, questions 6, 7, and 8 covered different positions based on a Likert scale. Respondents could choose from a 5-point scale ranging from 'strongly disagree' to 'strongly agree'.

3.4 Data analysis

It is important to select an analysis technique that matches the method of data collection. Furthermore, a choice needs to be made between a deductive or an inductive approach, because the approach influences the method of data collection.
3.4.1 Building theories from case study research

For this case study, the primary outputs were interview results. Analysing the data was performed using an inductive approach, which means that there are less concrete expectations. According to Eisenhardt (1989), it is important that the beginning of the research is guided as little as possible by existing literature. Nevertheless, having a research focus is vital, because it is easy to become overwhelmed by the amount of data. Therefore, the main research question of this survey served as focus for the research. To analyse a large amount of data, it is important to have a standardised process of coding and categorising. Each interview (transcription) was analysed by coding it. This means that every subject receives a label or code. Following the process of coding, each code is classified into categories.

Since each researcher can interpret interviews differently, the process of coding was shared with friends and relatives to offer them the possibility to add their own codes. Once this was done, a selection was made of the codes that best suit each statement.

In total, 8 of the 9 interviews were coded, because the final interview, with the company 2Dok, was only conducted at the end of the research. Nevertheless, the transcription of this interview is available in the appendices, and statements from the interview are used in the following chapter.

*Cronbach’s alpha*

Questions 6 and 7 both have a Cronbach’s alpha above 0.7, which means that the items in these questions are reliable enough for further statistical substantiation.

For Question 8, the reliability is defective, even after deleting items the Cronbach’s alpha remains below 0.7.

3.5 Methodological issues

To ensure that the quality of scientific research is maintained, it is important to focus on validity and reliability. A distinction is made between construct validity, internal validity, external validity, and external factors such as non-responses and issues to guarantee the anonymity of respondents.

The external validity of the current study is ensured because the interviews were conducted with key informants in the field of city logistics. Regarding the survey, 114 people completed it, which is a reliable number of respondents to perform a statistical analysis. Internal validity is ensured in the process of coding.
The interviews were recorded, and transcripts of these interviews were made and shared with interviewees to prevent misinterpretation. Regarding reliability, Yin (2009) states that, ‘the goal of reliability is to minimize errors and biases in a study.’

For the qualitative section of this study, reliability is ensured by using an existing approach, such as Eisenhardt (1989), and maintaining a standardised process during coding, which is shared with others to prevent bias. For the quantitative section of this study, statistical substantiation was performed using SPSS and standardised scales, such as the Likert scale. In addition, the questions are, as much as possible, based on existing questionnaires.

**Non-response**

During data collection, it is important that people and/or organisations willingly participate to collect the required data. During the selection process for the interviews, the invitation to participate often received no reply. Most non-responses were from (local) authorities, such as the municipality and other government-related organisations. Furthermore, it was often difficult to meet key informants, and therefore data had to be found on websites.

**Interpretation problems**

With a qualitative study there is a risk of creating bias or making a mistake in the interpretation of the opinions and visions of respondents. To prevent this, all transcriptions of the interviews were shared with the respondents. To prevent a misinterpretation or the forming of a bias, the codes (or labels) were analysed by two other researchers not involved in this study. Their interpretation was compared with already created labels, and in some cases led to new insights.

**Anonymity**

To ensure the anonymity of the participants in the survey, the questionnaire was created using a secure connection. Furthermore, no personal information was obtained, such as names and e-mail addresses. For the participants in the interviews, their names are not mentioned in the interview schedule, but in the transcriptions some names can be recognised. However, their personal information will not be shared with others. In some cases, sentences have been deleted from the transcription to remove competitive or business-sensitive information.
4 Findings

In this chapter the results of the study are described in greater detail. This is done by describing the most important outcomes of the study for each research question, both from the interviews and from the results of the survey.

4.1 Last mile delivery in the Netherlands

The ‘last mile’ is a phrase representing the movement of people and goods from a transportation hub to a final destination. In terms of E-commerce, the last mile is the section from the depot (e.g. mail sorting centre or distribution centre) to the receiver. This research focuses on last mile delivery in densely-populated areas within the Netherlands. Transport in urban regions is part of city (or urban) logistics, which has been defined as ‘the process for totally optimizing the logistics and transport activities by private companies with support of advanced information systems in urban areas considering the traffic environment, the traffic congestion, the traffic safety and the energy savings within the framework of a market economy’ (Taniguchi, 2001).

Available public space is an important element when measuring the traffic environment, and this is one of the problems for last mile delivery. Especially in historical cities, such as Amsterdam and Utrecht, the pressure on the available space is increasing. This pressure due to the (lack of) available space is confirmed by Dr. Walther Ploos van Amstel (lecturer and professor in city logistics attached to the University of Applied Science in Amsterdam), when addressing problems within the last mile.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Space, everywhere you can see, both freight traffic and personal mobility takes much space.’</td>
<td>‘Ruimte, dus overal zie je datowel het vrachtwagen verkeer als persoonlijke mobiliteit veel ruimte inneemt.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
</tbody>
</table>

The pressure on the available space is further increasing due to the phenomenon of urbanisation (Crosette et al. 2011), which has consequences in terms of traffic safety. Commercial vehicles, such as delivery vans and other freight traffic, are more often involved in traffic accidents compared with other vehicles. Walther Ploos van Amstel emphasises this in the following statements.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Freight traffic is seven times more often involved in accidents than personal cars. Safety is very important.’</td>
<td>‘Vrachtwagen is zeven keer vaker bij een ongeval betrokken dan personenauto’s. Veiligheid is heel belangrijk.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
<tr>
<td>‘In the four largest cities, we have annually 300 casualties caused by freight traffic.’</td>
<td>‘Als je kijkt dat we alleen in de vier grootste steden al driehonderd verwonden per jaar hebben door vrachtwagen.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
</tbody>
</table>
The consequences of E-commerce deliveries seem to play only a minor role in city logistics. According to Connekt (2017), in their annual outlook, only three percent of all vans are used for parcel deliveries. In terms of efficiency and pollution, the parcel sector operates relatively well. Sectors such as construction logistics and the catering industry are much larger in terms of pollution and numbers of vehicles. Even local authorities, such as the municipality of Amsterdam, with the transport flow between their facilities, are a significant factor in transport movement. The relatively well-operated parcel sector is confirmed by Walther Ploos van Amstel in the following statement.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘If there is one sector that is doing well, it is the parcel delivery sector. This sector is responsible for four percent of all freight traffic within the city.’</td>
<td>‘Als er nu een sector is die het goed doet, is het de pakketsector. De pakketsector is verantwoordelijk voor 4 procent van het vrachtverkeer in de stad.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
</tbody>
</table>

However, because delivery vans are clearly visibly in neighbourhoods, because they come to our front doors, and because of the annual growth of online purchases (Tradeglobal, 2015; Thuiswinkel.org, 2016), residents experience their nuisance value more directly.

**E-commerce deliveries**

That delivery vans literally stop by the front door of consumers is apparent in the results of the survey. Almost 94 percent of respondents chose a home delivery option, as illustrated in the following graph:

![Figure 9: Current delivery methods](source: Author)
The reasons for the increasing popularity of online shopping are illustrated in the following graph:

![Graph showing reasons for online shopping popularity](image)

**Figure 10: Reasons to shop online**  
*Source: Author*

Most consumers do their shopping online because it is easy to use; there is a wide range of products and they can be ordered instantly. PostNL, the largest post and package deliverer in the Netherlands, is one of the parties present in neighbourhoods, and they recognise that residents experience some inconvenience, mainly caused by the number of delivery companies in the area. This is evident in the following statement from an interview with a key informant for sustainability working for PostNL.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>'People find it annoying when various distributors and delivery services visit the neighbourhood one after another. Especially in urban areas.'</td>
<td>'Mensen vinden het hinderlijk dat er verschillende distributeurs of bezorgers na elkaar in de wijk komen. Met name in de stedelijke gebieden.'</td>
<td>Interview with PostNL</td>
</tr>
</tbody>
</table>

Although the percentage of vehicles involved in E-commerce deliveries is minor in comparison with other sectors, the number of stops per vehicle is significant. This is illustrated in the following statement from the founder of 2Dok Den Haag, an organisation that initiates cooperation for sustainable city logistics.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>'PostNL uses diesel vans, which affects the city. For example, when a van from PostNL drives alongside the canal in Amsterdam, it does not have one stop, but maybe 25.'</td>
<td>'Ze rijden wel met een dieselvoertuig en ze verstoren wel de stad eenmaal, want als op de Prinsengracht in Amsterdam een auto van PostNL rijdt, heeft hij er niet één stop. Maar dan heeft hij misschien wel 25 stops.'</td>
<td>Interview with 2Dok</td>
</tr>
</tbody>
</table>

The number of stops leads to congestion because vans block the street and are a nuisance in terms of noise pollution arising from the continuous stopping and acceleration with each delivery. When we focus on residents and consumers in terms of nuisance experienced due to the increasing number of deliveries in their neighbourhood, nearly 20 percent of the respondents indicated that their quality of life is affected, as illustrated in the following graph:
Since the respondents live in different areas of the Netherlands, the actual percentage of experienced nuisance is likely to be higher, because the effect on liveability is higher in cities than in rural areas.

**Different stakeholders, different interests**

As described in the theoretical framework, the role of stakeholders in city logistics is important. However, these stakeholders often have different interests, and therefore it is difficult to obtain common support to decrease the impact of city logistics. The role of the (local) authorities is also important in terms of enforcement and regulations. This is confirmed in the following statements from several interviewees.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘When it comes to interests in the city, there’s only be one party that can take the lead. That’s politics.’</td>
<td>‘Als het gaat over de belangen in de stad, is er maar één partij die de knopen door kan hakken. Dat is de politiek.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
<tr>
<td>‘It could be so much more efficient if the Government takes a different role.’</td>
<td>‘Het kan zoveel efficiënter als de overheid een andere rol in zou nemen.’</td>
<td>Interview with PostNL</td>
</tr>
<tr>
<td>‘So, I think, the Government, could have made a policy a long time ago, then people would not have to do it themselves. You actually see that municipalities want to go “faster” than the national Government.’</td>
<td>‘Dus dan denk ik, overheid, je had ook al lang een beleid kunnen maken dan hadden ze het niet zelf hoeven doen. Je ziet dan eigenlijk dat gemeentes sneller willen dan het rijk.’</td>
<td>Interview with 2Dok</td>
</tr>
</tbody>
</table>

Without the correct policy and enforcement, little will change. Web shops, for instance, often only have a vision in terms of market share and generating revenue and profit at the lowest possible costs, and delivery companies do not want to cooperate for fear of losing brand recognition. In addition, delivery companies face pressure from web shops during tariff negotiations.
This was confirmed in the interview with PostNL, in which the interviewee made the following statement.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Everyone puts each other under maximum pressure for the lowest possible price. It is good from an economic perspective. From a sustainability perspective, it does not lead to the desired developments.’</td>
<td>‘Iedereen zet elkaar maximaal onder druk voor een zo laag mogelijke prijs. Vanuit economisch perspectief is dat goed. Vanuit duurzaamheidsperspectief leidt het niet tot de gewenste ontwikkelingen.’</td>
<td>Interview with PostNL</td>
</tr>
</tbody>
</table>

Some cities are more advanced in terms of enforcement and policy. Amsterdam, Rotterdam, and Utrecht, for example, have environmental zones to improve air quality. Even the business world has provided innovations, such as alternative forms of delivery. These so-called ‘smart initiatives’ are described in more detail in the following section.

4.2 Smart initiatives in last mile delivery

Despite the lack of a national policy regarding the sustainability of city logistics, some cities have their own advanced policy. These policies encourage entrepreneurs to undertake a more sustainable business operation. Corporate social responsibility is an increasingly important factor for organisations, which leads to new initiatives, both by established delivery companies and by start-ups. Three start-ups were interviewed, and their foci are listed in the Table 1, below.

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Focus</th>
<th>Smart initiative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Dok</td>
<td>Last mile logistics</td>
<td>Cooperation between logistics parties Common IT network</td>
</tr>
<tr>
<td>BuurtMus</td>
<td>First mile logistics</td>
<td>Collect parcels for return delivery</td>
</tr>
<tr>
<td>Parcel4Me</td>
<td>Last mile logistics</td>
<td>Network of parcel lockers IT development</td>
</tr>
</tbody>
</table>

Table 1: Start-ups in city logistics Source: Author

The general vision of these start-ups was discussed during the interviews, and opinions differed. Walther Ploos van Amstel even calls the increase in the number of start-ups ‘worrying’ in the following statement.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘That is very worrying, some of them are operating quite well, but are never going to make it. […] those volumes are too small.’</td>
<td>‘Dat is heel zorgwekkend. Je hebt er een aantal, die wel aardig zijn, maar die het ook nooit gaan halen. […] Maar die volumes zijn ook te klein.’</td>
<td>Interview Walther Ploos van Amstel</td>
</tr>
</tbody>
</table>
This view is reflected in the literature. Quak et al. (2014) mention that start-ups often depend on subsidies and external capital, and when this funding stops, it often means the end of an initiative. Nevertheless, start-ups do have an important contribution to make in city logistics; they make existing companies think about their business model. Start-ups often have a more sustainable approach than established businesses, with sustainability being an important part of their business management. BuurtMus differentiates itself by focusing on first mile delivery; the return flow of parcels. If a consumer would like to return a parcel, they often need to go to a parcel point and use their car for the trip, which impacts the environment.

Therefore, EY was also approached for this study, as they researched the ‘footprint’ in the last mile, together with organisations such as Thuiswinkel.org (the umbrella organisation for Dutch web stores) and PostNL as the delivery party. One of the results from EY’s research is that about 70 percent of consumers use a car to drive to a pick-up point. A start-up such as BuurtMus responds to this by taking this process over from the consumer, with the use of cargo bikes.

Another interesting start-up involved in this study is Parcel4Me. This company focuses on parcel lockers, both by creating the locker itself and developing the software for the locker. Parcel4Me works in collaboration with PostNL, and currently has a network of 25 parcel lockers in the Netherlands. This number is currently not high, but the underlying idea is an important one – setting up a white labelled network that everybody can join.

Some of these smart initiatives are apparent in our daily lives. In the centre of Amsterdam, for example, deliveries are now being made by cargo bikes and electric vehicles (EVs). Most smart initiatives remain out of sight of residents and consumers as they are often IT related. Nevertheless, there is an important part in which these initiatives are involved: the last mile. Consumers are capricious and difficult to influence. A more sustainable delivery is only one part of the last mile. The number of failed deliveries because a consumer is not at home, for example, needs to be reduced. An important element in this is the role of IT.

**Address intelligence**

Walther Ploos van Amstel mentioned during his interview: ‘We must ensure consumers are at home.’ This sounds easier than it is; in most web shops consumers cannot choose a specific time slot, which means that the delivery can be made any time during the day. Consumers are not willing to wait inside the entire day, which leads to a major problem. Address intelligence will reduce the number of failed deliveries. Walther Ploos van Amstel emphasises the role of IT and address intelligence in the following statement.
Albert Heijn, the largest grocery store in the Netherlands, already delivers using specific time slots, and they send consumers a message just before arriving at their front door. In the interview with a key informant for the online grocery division of Albert Heijn, they believe real-route scheduling to be an important development to improve their business model.

Finally, PostNL believe that big data and other IT-related developments will lead to new insights, such as smart mobility.

**Smart mobility**

An important party in city logistics is the local authority, as they are responsible for regulations and enforcement in their city. Using the available resources, such as road sensors and cameras, much data can be collected. Traffic data are important factors in last mile delivery. These data provide insights into traffic flow and available loading and unloading spaces in the city. To enable real-route scheduling, such data are important. According to Walther Ploos van Amstel, Amsterdam is the most advanced city in this development in the Netherlands because the local authority uses traffic data. Rotterdam and Utrecht are also quite advanced in their use of smart mobility. The Hague is catching up on smart mobility, and has an increasing awareness of city logistics, but is not finished yet.

Developments such as address intelligence lead to new possibilities for consumers in terms of receiving their online purchases. In the consumer survey, one question asked how likely consumers are to think about using different delivery options.
Consumers: Vision on smart initiatives and willingness to pay

In the following graph, the most likely used delivery options, in the opinion of the consumer, are illustrated.

![Future vision delivery options](image)

**Figure 12: Future vision delivery options**  
Source: Author

Further research based on age leads to the following insights, as shown in the graph, below.

![Future vision of delivery options based on age](image)

**Figure 13: Future vision of delivery options based on age**  
Source: Author

Delivery on demand is by far the most chosen option. It is notable is that especially respondents over the age of 35 believe in delivery on demand, despite E-commerce deliveries often being delivered anytime during the day. In terms of the education level of the respondents, the differences are less marked, and therefore not displayed.

The larger web shops used in the Netherlands, such as Bol.com, Coolblue, and Wehkamp, offer some of the above delivery options. All offer same-day delivery for a range of products. However, same-day delivery influences the supply chain, as it is less efficient. Web shops charge the consumer more for this type of delivery because the margins for the delivery process are already quite low.
In the following graph, the percentage of respondents willing to pay for a specific delivery option is illustrated.

<table>
<thead>
<tr>
<th>Willingness to pay extra for more sustainable delivery method</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3,51%</td>
<td>11,40%</td>
<td>28,95%</td>
<td>24,56%</td>
<td>31,58%</td>
</tr>
<tr>
<td>Willingness to pay extra for delivery within specific timeslot</td>
<td>0,88%</td>
<td>20,18%</td>
<td>29,82%</td>
<td>38,60%</td>
<td>40,35%</td>
</tr>
<tr>
<td>Willingness to pay extra for one-hour delivery</td>
<td>1,75%</td>
<td>12,38%</td>
<td>18,42%</td>
<td>27,19%</td>
<td>40,35%</td>
</tr>
<tr>
<td>Willingness to pay extra to choose from multiple delivery methods</td>
<td>0%</td>
<td>8,77%</td>
<td>17,54%</td>
<td>18,42%</td>
<td>55,26%</td>
</tr>
<tr>
<td>Willingness to pay extra for same-day delivery</td>
<td>0,88%</td>
<td>22,81%</td>
<td>30,70%</td>
<td>29,82%</td>
<td>11,40%</td>
</tr>
</tbody>
</table>

Figure 14: Willingness to pay for delivery method  
Source: Author

An interesting statistic from the above graph is that 32 percent of the respondents agreed, or even strongly agreed, to pay extra if web shops offer a (more) sustainable delivery method. Nevertheless, only 23 percent of the respondents were aware of the environmental impact of last mile delivery, as illustrated in the following graph.

<table>
<thead>
<tr>
<th>I’m aware of the environmental impact caused by the delivery of online purchases</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No opinion</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,63%</td>
<td>21,05%</td>
<td>22,81%</td>
<td>14,04%</td>
<td>39,47%</td>
</tr>
</tbody>
</table>

Figure 15: Awareness of the environmental impact of E-commerce deliveries  
Source: Author

The above results demonstrate one of the problems with the last mile delivery of E-commerce products: a lack of awareness. In the following final section of this chapter, we evaluate the term ‘sustainability’ in last mile delivery.
4.3 Evaluating sustainability in last mile delivery

Sustainability is a broad concept that extends much further than the emission of GHG. The concept covers the influence on our daily lives in terms of the nuisance and quality of life residents experience.

**Towards zero-emission deliveries**

During the interviews, one thing frequently mentioned by several interviewees was that making their fleets (more) sustainable with the use of EVs, for instance, is quite expensive and less efficient for their business. This is evident in the following statements.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>'There is one problem, it is really expensive.'</td>
<td>'Er is één probleem gewoon, dat het zo ontzettend duur is.'</td>
<td>Interview with PostNL</td>
</tr>
<tr>
<td>'The moment you replace that diesel engine with a large battery, then you have a lot of extra weight for that van, and it means that many fewer washing machines can be loaded. Therefore, it is very difficult to find a good route to drive which is cost efficient.'</td>
<td>'Op het moment dat je die dieselmotor gaat vervangen door een grote accu, dan heb je dus een hele hoop extra gewicht voor dat busje en betekent het dat veel minder wasmachines mee kan nomen en dat het dus kostentechnisch heel lastig is om nog een goede route te rijden.'</td>
<td>Interview with Coolblue</td>
</tr>
</tbody>
</table>

Walther Ploos van Amstel contradicts these statements, however. During his interview, he mentioned that the lifecycle costs of an EV van are already lower in comparison with a diesel van. Especially in urban areas, EVs are relatively efficient and can contribute to zero-emissions. Furthermore, despite the costs involved for the transition, the switch is being made to a more sustainable delivery in cities. PostNL, for example, confirmed that delivery with EVs is much more efficient in cities in comparison with rural areas. This is evident in the following statement.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>'What you see is that alternatives, such as electric transport, that do not pay off elsewhere, are worthwhile in cities.'</td>
<td>'Wat je vaak ziet is dat alternatieven, die elders niet lonend zijn, ik noem maar wat elektrisch vervoer, dat die in de binnensteden wel lonend zijn.'</td>
<td>Interview with PostNL</td>
</tr>
</tbody>
</table>
**Involve consumers in making last mile delivery more sustainable**

Consumers should be involved in e-commerce deliveries, and this creates an important role for web shops. This research indicates that only 23 percent of the respondents agreed or strongly agreed that they were aware of the environmental impact of their deliveries (see Figure 15). EY supported this view during their interview.

Web shops should involve consumers to create awareness of the effect of their deliveries on sustainability. Coolblue directs consumers towards buying more sustainable products by placing such products at the top of their web shop. However, Coolblue does not involve the consumer in last mile delivery. Like most web shops, Coolblue do not regard this as part of their business.

As illustrated in the following graph, nearly 58 percent of the respondents were willing to wait an extra day if this helped reduce the impact of their delivery in terms of sustainability.

![Percentage of respondents](image)

**Figure 16: Willingness to wait to help the environment**  
Source: Author

This leaves only the need for regulation and enforcement by local authorities. Companies often point to each other regarding who needs to be in charge, but there is only one party that can properly take the lead in this: The Government.
Towards zero-impact last mile delivery

Neighbourhood traffic nuisances are often caused by there being several delivery organisations in the Netherlands. In addition to the large delivery operators, such as PostNL, DHL, UPS, and DPD, an increasing number of web shops are employing their own delivery service. This development is a major problem within last mile delivery, according to Walther Ploos van Amstel, and means that several delivery companies are driving around in neighbourhoods, often to deliver only a few packages. This situation has arisen because each web shop uses a different subcontractor or makes their own deliveries.

Lack of cooperation is an important aspect in the traffic and delivery nuisance that residents experience. Residents are angry and frustrated about the number of delivery vans in their streets.

One important cause of the lack of collaboration is simple to identify: Organisations often refuse to share their networks with competitors. The solution to this problem is a finely-meshed network of logistic service providers, strengthened using UCCs. Walther Ploos van Amstel confirmed this in the following statement.

<table>
<thead>
<tr>
<th>Statement in English</th>
<th>Uitspraak in het Nederlands</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘The solution in urban logistics is fairly simple: You have to bundle goods flows on the outskirts of the city, and there needs to be more cooperation between entrepreneurs.’</td>
<td>‘De oplossing in stadslogistiek is vrij simpel. Aan de rand van de stad moet je goederenstromen bundelen. Er moet meer samenwerking komen tussen ondernemers.’</td>
<td>Interview with Walther Ploos van Amstel</td>
</tr>
</tbody>
</table>

2Dok Den Haag is one organisation committed to cooperation. They facilitate an IT network in which different companies share their information and planning, making it possible to bundle goods flows in a central hub to reduce the number of vehicles in the city. 2Dok Den Haag is an interesting party with a vision about making city logistics more efficient.

We do envisage a more sustainable delivery system, with the use of EVs, cargo bikes, and other promising pilot projects. The challenge is to focus on collaboration, and if this does not come from the business world, the Government must act.
5 Conclusion, discussion, and recommendations

5.1 Conclusion

The main purpose of this research was to obtain insights into the last mile of E-commerce deliveries, as part of city logistics in the Netherlands. To evaluate the sustainability of last mile delivery, interviews were held with different stakeholders. In addition, a survey was distributed among consumers. The main research question of this study was: **How can ‘smart initiatives’ contribute to a more sustainable approach in ‘last mile delivery’ in urban areas?** To answer this research question, the sub-research questions are answered first.

**What is the current situation of ‘last mile delivery’ in the Netherlands?**

The parcel sector is doing relatively well already in terms of emissions in city logistics (four percent of total emissions). This is confirmed by the research carried out by Connekt (2017). Technical innovations in the automotive industry have contributed to this low figure and have led to a more sustainable delivery method. The large delivery companies, such as PostNL and DHL, now often deliver using zero-emission vehicles in city centres. These results are in line with Taniguchi et al. (2015) and Browne et al. (2012), demonstrating that energy savings can be achieved with the use of low-energy and low-emission vehicles.

**Which smart initiatives are being used in ‘last mile delivery’?**

In practice, we do see ‘smart initiatives’ in the form of low or even zero-emission vehicles, as illustrated in Appendix 1. The most important smart initiatives are more difficult to observe because they often concern data about further optimising the process of the last mile delivery. These initiatives focus on predicting consumer behaviour and traffic data to be able to organise real-time planning. The most important development is address intelligence, which is designed to reduce the number of failed deliveries due to the consumer not being at home. Using the available data, often made available by municipalities, parcel delivery companies can better plan and deliver within a specific time slot, which increases the chance of a consumer being at home and reduce the amount of redeliveries.
What is the contribution of ‘last mile deliveries’ to sustainability in terms of emission and social sustainable cooperation in the Netherlands?

In terms of limiting the emissions of GHG in the last mile of E-commerce deliveries, the parcel sector is doing relatively well. There is an increase in the number of sustainable vehicles in cities, and environmental zones in municipalities have made the traditional combustion engine more sustainable. However, sustainability is about more than simply emissions. The lack of cooperation between stakeholders leads to an unnecessary increase in the number of vans entering neighbourhoods, and the increase in the number of web shops that deliver their products themselves is an undesirable development.

Consumers are often unaware of the environmental impact of their chosen delivery method. However, many indicated that they are willing to wait an extra day if the delivery impact of their online purchased products can be reduced.

Now the sub-questions have been answered, the main research question can be answered. Smart initiatives contribute to a more sustainable last mile delivery. Regarding deliveries, there is an increase in the number of sustainable vehicles. To further reduce the environmental impact, cooperation between stakeholders is important, and developments in IT, such as address intelligence, make it possible to deliver more efficiently.

An important solution in city logistics is using UCCs on the edges of cities. There, goods flows are bundled and then delivered using a sustainable vehicle. Collaboration is needed for this, however, and it is the role of the Government to stimulate and enforce cooperation to move from zero-emissions to zero-impact deliveries!

5.2 Discussion

For this study, interviews were conducted and a survey was distributed, and the interviews were recorded and transcribed. Therefore, it can be stated that if the research were repeated, the results would be the same and that the results of this research are valid. The same applies to the results based on the survey; the data were analysed using SPSS, and therefore repeating the research should lead to the same results.

The interview with Walther Ploos van Amstel, lecturer in city logistics, revealed that the package sector is already relatively efficient. Construction traffic and deliveries to the catering industry form a much larger percentage in terms of emissions and number of vehicles. This is in line with the expectations of Connekt’s research (2017). The large delivery companies, such as PostNL and DHL, now often deliver using zero-emission vehicles in city centres. These results are in line with Taniguchi et al. (2015) and Browne et al. (2012),
demonstrating that energy savings can be achieved with the use of low-energy and low-emission vehicles.

One important factor in the complexity of last mile delivery is that several stakeholders are involved, often with different interests. One method of addressing this is the involvement of (local) authorities. These results corroborate the ideas of Stathopoulos et al. (2012) and Taniguchi et al. (2014), who suggest that the main purpose of local authorities is improving quality of life for their residents. This viewpoint is consistent with the data obtained in the interviews. The most interesting finding was that (local) authorities need to take the lead in this area via the use of regulations and enforcement.

In three of the four largest cities in the Netherlands, the local authorities have passed LEZ regulations to improve air quality. Gehrzits (2017) indicates that the use of LEZ contributes to a reduction in pollution; however, Browne et al. (2012) demonstrate that the pollution results of LEZ are lower than expected. This study has been unable to corroborate this. Despite people having the knowledge and experience to create solid business models, this study suggests that there is lack of cooperation between cities, and that subsidy schemes differ too much per municipality. These results support Quak et al. (2014), who suggest that when new initiatives are introduced, they do not always have a clear business model.

The results of this study indicate that the use of UCCs on the outskirts of cities is an important factor in making the last mile more sustainable. These results corroborate the ideas of van Heeswijk et al. (2017), who researched the optimisation of UCCs. Nevertheless, Browne et al. (2005) demonstrate that most UCCs have only a short lifespan because of their strong reliance on funding and subsidies. This, however, does not appear to be the case in this study. The findings of this study suggest that collaboration between stakeholders is required to achieve effective UCCs. Established companies that are involved in deliveries should share transport, making it possible to bundle their parcels. Generally, however, it seems that companies do not want to collaborate because they regard each other as competitors. This outcome is contrary to that of Verlinde (2016), who developed a triple helix model, and the research of Kiba-Janiak (2016), who developed models to meet key success factors for several stakeholders.

During this study it was relatively easy to come in contact with stakeholders involved in city logistics and the last mile delivery. Most of these stakeholders were willing to cooperate, by participating in the interviews. The outcomes of the interviews are largely in line with the findings from the literature.
An interesting finding is the differences in opinion of the interviewees with regard to the growth in the number of start-ups involved in the last mile delivery. In the literature, in the literature relatively little has been written about start-ups, so it is good to involve these start-ups in this study.

However, it must be acknowledged that this research has limitations. For example, no sample size was calculated prior to the survey. The reason for this is that the research has a particularly qualitative approach and the survey was added during the research. In addition, the survey is limited to consumers who bought online products. Although respondents were able to state that they had never had online products delivered, all the other questions were focused on consumers who had had products delivered, which meant that some of the respondents could not continue with the survey.

In addition, based on the results from the interviews, it appears that the Government takes too little action regarding city logistics. However, municipalities and other government bodies were not involved in this study. For this reason, no statement can be made about the lack of control by (local) authorities; perhaps they are working to address the issue, but other stakeholders simply do not experience or appreciate this.

The advice for practitioners mainly concerns facilitating cooperation and involvement between stakeholders. Web shops should involve the consumer more in making last mile delivery more sustainable by informing them of the consequences of a certain delivery method in terms of CO₂ emissions. In addition, cooperation is necessary to further reduce the environmental impacts arising from last mile delivery. Through cooperation, further efforts can be made to bundle goods flows on the outskirts of cities, and therefore the number of vehicles involved in the last mile can be further reduced.

The advice for follow-up research is therefore to carry out similar research, but involve the (local) government and residents. This is to investigate whether too little attention is paid to the sustainability and improvement of urban logistics by (local) authorities and the nuisance experienced by residents resulting from the last mile delivery. Furthermore, developments are ongoing, for example, address intelligence, which introduces new challenges, such as ensuring the privacy of consumers and residents when organisations have access to sensitive information (e.g. consumer behaviour). Research should be conducted into how to encourage cooperation between stakeholders. Stakeholders have different interests, but there needs to be a way to create more solidarity between them. Finally, further research should be conducted into the consequences of each delivery method, to follow-up on the research by EY (2015), for example.
References

- Balm et al. (2016). *The purchasing behavior of public organizations and its impact on city logistics*, The 9th International Conference on City Logistics, Tenerife, Canary Islands (Spain), 17-19 June 2015, Transportation Research Procedia 12 (2016) 252 – 262
- Connekt (2017). Topsector Logistiek, Annual Outlook 2017
- EY, Ernst & Young (2015), The green mile? Over de duurzaamheid van de ‘last mile’ in de Nederlandse e-commerce


Meints, P. (2013). The Dutch Retail Supply Chain – Trends & Challenges. 18th Twente Student Conference on IT. January 2013, University of Twente: Enschede.


Perboli et al. (2017). Parcel Delivery in Urban Areas: Opportunities and Threats for the Mix of Traditional and Green Business Models, CIRREL.

Ploos van Amstel, W. (2015). Working on livable cities through sustainable city logistics, Urban technology research programme, Hogeschool van Amsterdam (HvA)


- UPS (2017), The road to sustainable urban logistics, GreenBiz Research Study
Appendix 1: Smart initiatives: Zero-Emission delivery in the Netherlands

Initiative 1: ‘The Stint’, PostNL

Initiative 2: ‘Cubicycle’, DHL
Initiative 3: ‘Parcel locker’, PostNL and Parcel4Me

Initiative 4: ‘Light Electric Vehicle (LEV)’, PicNic
Appendix 2: Data matrix interviews

Coded interview Walther Ploos van Amstel

<table>
<thead>
<tr>
<th>Text (citation from interview)</th>
<th>Open Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Ruimte, dus overal zie je dat zowel het vrachttverkeer als persoonlijke mobiliteit veel ruimte inneemt'</td>
<td>Persoonlijke mobiliteit</td>
</tr>
<tr>
<td>'Het is inderdaad zeker complex'</td>
<td>Complexiteit stadslogistiek</td>
</tr>
<tr>
<td>'Nou, in het algemeen kom je er niet uit, omdat de belangen te groot zijn.'</td>
<td>Belangen stakeholders</td>
</tr>
<tr>
<td>'Dus het enige wat helpt, is dat op een gegeven moment de overheid knopen doorhakt op basis van wat de maatschappelijke kosten en baten zijn.'</td>
<td>Inmenging overheid noodzakelijk</td>
</tr>
<tr>
<td>'Baten gewogen in gezondheid, leefbaarheid en hoe de kwaliteit van de leefomgeving is.'</td>
<td>Baten ten aanzien van aantrekkelijke leefomgeving</td>
</tr>
<tr>
<td>'Want als bewoner, zie je natuurlijk het liefst een stille straat, maar tegelijkertijd wil je als bewoner ook kunnen parkeren. Ja, alleen al het perspectief bewoners staat zo lijnrecht tegenover elkaar bij dit soort vragen.'</td>
<td>Bewoners</td>
</tr>
<tr>
<td>'Als het gaat over de belangen in de stad, is er maar één partij, die daar de knopen door kan hakken. Dat is de politiek. En de politiek moet richtlijnen geven voor de ambtenaren. Die moeten zorgen dat de zaken geregeld worden, en vervolgend gehandhaafd worden. En dat regelen, dat inrichten is één, maar vervolgens het handhaven, dat ontbreekt in heel veel gemeenten.'</td>
<td>Inmenging politiek</td>
</tr>
<tr>
<td>'Nou, vaak zit bij de ambtenaren vaak nog niet helemaal het besef wat nu echt belangrijk is.'</td>
<td>Gebrek aan urgentie</td>
</tr>
<tr>
<td>'Ja, de overheid laat de burgers, de bewoners, in de steek. Dat is, het betrouwbaarheid, als je kijkt naar beslissingen over mobiliteit in steden van de overheden, die bedroevend is.'</td>
<td>Betrokkenheid overheid</td>
</tr>
<tr>
<td>'Ja, nou, bewoners zijn vooral bewoners. Je consuneert niet zoveel in de stad.'</td>
<td>Bewoners</td>
</tr>
<tr>
<td>'Ja, maar in steden is dat niet wezenlijk anders dan op het platteland.'</td>
<td>Bezorging stad versus platteland</td>
</tr>
<tr>
<td>'Als er nu een sector is die het goed doet, is het de pakketsector. De pakketsector is verantwoordelijk voor 4 procent van het vrachttverkeer in de stad. Dat is minimaal 96 procent, allemaal business to business.'</td>
<td>Efficiency pakketsector</td>
</tr>
<tr>
<td>'Pakketjes worden al zo efficiënt bezorgd, met elektrische voertuigen, met kleine voertuigen, met cargo bikes.'</td>
<td>Efficiency pakketsector</td>
</tr>
<tr>
<td>'Tachtig procent van de ambtenaren is ook nog een keer een extern ingehuurde ZZP’er, met weinig betrokkenheid bij de stad.'</td>
<td>Betrokkenheid ambtenaren</td>
</tr>
<tr>
<td>'Je zult als overheid een beeld moeten ontwikkelen, van hoe wil ik dat mijn stad eruit ziet?'</td>
<td>Visie</td>
</tr>
<tr>
<td>'De nationale overheid zou zich moeten bemoeien, zeker met de Europese Unie erachter, met de voertuignormen. Dat geldt voor milieu, uitstoot, geluid en veiligheid.'</td>
<td>Stedelijke planning</td>
</tr>
<tr>
<td>'Vrachttverkeer is zeven keer vaker bij een ongeluk betrokken dan personenauto’s. Veiligheid is heel belangrijk.'</td>
<td>Visie</td>
</tr>
<tr>
<td>'Maa ook met wat zijn de kwalificaties van chauffeurs? Waarom hebben wij niet een verschillend rijbewijs voor een vrachtwagenchauffeur in de stad als voor een chauffeur buiten de stad? Waarom hebben we eigenlijk geen rijbewijs voor mensen met een bestelbus?'</td>
<td>Kwalificaties chauffeurs</td>
</tr>
<tr>
<td>'Lokaal is de gemeente verantwoordelijk voor de leefbaarheid, luchtkwaliteit en de uitstoot van CO2.'</td>
<td>Verantwoordelijkheid gemeente</td>
</tr>
<tr>
<td>'En ik vind dus dat lokaal beleid moet kunnen voeren. Ik vind dat Amsterdam een ander beleid moet kunnen</td>
<td>Lokaal beleid</td>
</tr>
</tbody>
</table>
voeren dan Utrecht. Het is gewoon een hele andere stad. Rotterdam heeft een heel ander soort problematiek met luchtkwaliteit dan Amsterdam. In Amsterdam is de bereikbaarheid veel meer het probleem, de ruimte. Rotterdam is plat gebombardeerd, dus die barsten van de ruimte als het gaat over stadslogistiek.’

‘Nou nee, er is geen gebrek aan urgentie. In tegendeel zelfs. Je ziet zelfs de VVD in zijn verkiezingsprogramma hebben staan dat het stadsverkeer de stad uit moet. Er is een hele grote mate van urgentie.’

‘Op dit moment zijn de lifecycle kosten van een elektrisch busje lager dan die van een dieselbus.’

‘Wat we zien, is dat we alleen nog maar meer bestelbusjes in steden zien. Dat heeft voor een heel klein deel te maken met E-commerce, en heel veel te maken met het feit dat de bouw en de horeca is gaan digitaliseren.’

‘Dus er moet heel veel gebeuren. En daar zijn maar twee of drie instrumenten voor. Eén is gewoon pijn, je mag er niet meer in.’

‘Als je kijkt dat we alleen in de vier grootste steden al driehonderd verwonden per jaar hebben door vrachtwagenverkeer.’

‘Ik ben blij dat we toch drie pakketbezorgers in Nederland kunnen kiezen. Want daardoor hebben we nog enige innovatie, waar de consument beter van wordt.’

‘Dat is heel zorgwekkend. Je hebt er aantal, die wel aardig zijn, maar die het ook nooit gaan halen. Eén van je buren wordt dan een pick-up point, zoals bij ViaTim en dat soort start-ups. Maar die volumes zijn ook te klein.’

‘Ja, anders lukt het niet allemaal. Nee, want de overheid ziet hier ook niets in.’

‘De oplossing in stadslogistiek is vrij simpel. Aan de rand van de stad moet je goederenstromen bundelen. Er moet meer samensmelting tussen ondernemers, die ontvangen en het is gewoon afdingen.’

‘Nee, besef ook dat je met ritten als same-day delivery, ongelofelijk veel autoritten spaart. Dat laten alle studies ook zien en mensen die daadwerkelijk hun auto wegdoen omdat ze hem niet meer nodig hebben.’

‘Het enige wat je je kan voorstellen, bij last mile problematiek, is dat er steeds meer bedrijven zelf beginnen met de bezorging te doen.’

‘Dus we moeten zorgen dat mensen thuis zijn. Nou, zorg ervoor dat mensen thuis zijn, dan kan je vaker leveren. Dat gaat PostNL ook doen. En nog belangrijker, als je mensen van tevoren zegt hoe laat ze er ongeveer zijn, dan loopt de kans dat ze er zijn ontzettend op.’

‘Met name IT-gebied, zoals een address intelligence, dat
je op postcode gebied nauwkeurig weet wat de kans is dat iemand een keer thuis is. En dan ga je dus op wijkniveau denken, wat zijn de beste oplossingen om zo efficiënt mogelijk dingen te doen? Nou, tot nu toe is in de steden, veertig procent van de consumenten niet thuis. Maar nog maar vijf procent van de webwinkels biedt jou de mogelijkheid om op tijdafspraak te leveren.’

‘Er is van alles veranderd. Want sinds die er is, is nu 98 procent van Euro5 naar Euro6.’

‘Ja, Amsterdam is meer van de wortel in de stad. Die hebben ook inzicht in verkeersdata, zodat auto’s beter kunnen doorstromen in de stad. Ze zijn echt echter met smart mobility bezig. Amsterdam is het meest ver. De tweede stad die heel erg ver is, is Rotterdam, alleen die hebben nog wat last met de daadwerkelijke uitvoering. Die zijn wel heel strikt met milieuzones, maar lopen nog achter als het gaat om bouwlogistiek. Dan Utrecht, die zijn heel erg goed. Wat de kracht van Utrecht is en dat heeft Amsterdam wat minder, ze hebben een integraal mobiliteitsplan. En dan slotte, die wel bezig zijn, maar nog niet klara zijn, is Den Haag. Die zouden best wel eens in inhaalslag kunnen maken.’

‘Nederland is zeker geen voorloper. Parijs is veel verder dan wij. Londen is veel verder, steden als Stockholm, Göteborg, Wenen maar ook Italiaanse steden. We hebben tien jaar niks gedaan, maar de afgelopen vier jaar is er ineens de belangstelling gekomen.’

<table>
<thead>
<tr>
<th>Address Intelligence</th>
<th>Milieuzones Effect</th>
<th>Verschil aanpak tussen de vier grote steden Randstad</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Er is van alles veranderd. Want sinds die er is, is nu 98 procent van Euro5 naar Euro6.’</td>
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</tr>
</tbody>
</table>
## Coded interview PostNL

<table>
<thead>
<tr>
<th>Text (citation from interview)</th>
<th>Open Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Wat wij vooral zien is dat de wens, naar schoner en stiller vervoer, dat die toenemt.'</td>
<td>Wil voor verduurzaming</td>
</tr>
<tr>
<td>'Mensen vinden het hinderlijk dat er verschillende distributieuren in de wijk komen. Met name in de stedelijke gebieden.'</td>
<td>Hinder diverse bezorgpartijen</td>
</tr>
<tr>
<td>'Wat we verder zien is dat gemeentes ook heel sterk aandringen om constructies te bedenken om de binnenstad anders te kunnen beleveren.'</td>
<td>Alternatieven</td>
</tr>
<tr>
<td>'En niet alleen wij hoor, maar in de brede zin, dat zijn ontwikkelingen die je ziet en dat heeft volgens mij te maken met het feit dat een hele hoop binnensteden gewoon een luchtverontreinigingsprobleem hebben.'</td>
<td>Leefomgeving</td>
</tr>
<tr>
<td>'Ja, vanuit de burger en de overheid moet ik even zeggen. En natuurlijk ook in principe van ons zelf maar ik kan het misschien ook anders formuleren, onze licence to operate, gaat ervan uit dat we in ieder geval altijd in de binnenstad kunnen zijn.'</td>
<td>Wil voor verduurzaming</td>
</tr>
<tr>
<td>'Als je kijkt naar een stad als Amsterdam, dan zie je dus gewoon van, dat is op termijn gewoon een risico voor onze business, dus dan moeten wij alternatieven bedenken.'</td>
<td>Binnenstadbelevering</td>
</tr>
<tr>
<td>'Wat je vaak ziet is dat alternatieven, die elders niet lonend zijn, ik noem maar wat: elektrisch vervoer, dat die in de binnensteden wel lonend zijn. En ook gewoon elektrisch vervoer, niet alleen met de auto's, maar ook met bakfietsen en andere alternatieve vervoersnormen.'</td>
<td>Baten EV's binnenstad</td>
</tr>
<tr>
<td>'Wij piloten op verschillende plaatsen met elektrische voertuigen en binnenstadbelevering.'</td>
<td>Gebruik EV's</td>
</tr>
<tr>
<td>'Eigenlijk zou ik moeten zeggen, dat als je een efficiënte belevering van de binnenstad zou willen hebben, in mijn optiek, dan zou je eigenlijk één of twee partijen toe moeten laten en die exclusief recht geven om spullen te bezorgen.'</td>
<td>Reduceren aantal bezorgpartijen</td>
</tr>
<tr>
<td>'Wat je gewoon merkt is het lastig is om alles en iedereen op één lijn te krijgen. Ik weet niet hoeveel partijen je hebt die de binnenstad in willen omdat ze iets moeten afleveren. Maar goed, daar gaan wij als bedrijf niet over maar dat is een tip voor de politiek.'</td>
<td>Diverse bezorgpartijen</td>
</tr>
<tr>
<td>'Ik denk van je kan het zoveel efficiënter als de overheid een andere rol zou in nemen.'</td>
<td>Regulering overheid</td>
</tr>
<tr>
<td>'We beleveren met elektrische bakfietsen en kleine karretjes. Dat heeft in ons model op zich wel een nadeel want in een vrachtauto kan natuurlijk een stuk meer dan in zo'n karretje. Dat dat betekent dat je tussenpunten moet maken waar je dan een overslag kunt regelen.'</td>
<td>Voorbeelden duurzamere aanlevering</td>
</tr>
<tr>
<td>'Het is gewoon heel lastig om iedereen op één lijn te krijgen en precies wat je zegt: we hebben veel verschillende belangen en vaak zijn dat ook belangen die haaks op elkaar staan.'</td>
<td>Overslagpunten noodzakelijk</td>
</tr>
<tr>
<td>'En dank denk ik, wie kan de lead nemen, degene die de baas is, dat klinkt dan wel heel simpel. Maar ik denk toch dat een overheid veel meer leid zou moeten nemen. Goed, dat ligt bij steden natuurlijk complex want de stad is in beginsel voor iedereen toegankelijk. Maar dat toch, de gemeente te weinig, hoe moet ik dat zeggen, dingen afdwingen.'</td>
<td>Samenwerking lastig Tegenstrijdige belangen</td>
</tr>
<tr>
<td>'Nou, dat krijg je ook bij de onderhandelingen met een Bol.com natuurlijk. Als Bol.com met ons onderhandelt, als wij onderhandelen met subcontractors, dus iedereen zet elkaar maximaal onder druk voor een zo laag mogelijke prijs. Vanuit economisch perspectief is dat goed, denk ik. Vanuit duurzaamheidsperspectief'</td>
<td>Overleg met webwinkels Kostprijs</td>
</tr>
</tbody>
</table>


| 'Wat ik wel vind, is dat ons bedrijf bijvoorbeeld te weinig doet, wat webwinkels bijvoorbeeld doen, is meerdere opties geven. Dat je ziet dat er wel meerdere opties zijn met betrekking tot bestelmoment. Je ziet bijvoorbeeld bestellen op zondag, kost een euro extra afz. Of bestellen tussen negen en of tussen de zeven en tien uur ‘s avonds, nou dat kan tegenwoordig ook, kost ook wat extra. Maar wat je bijvoorbeeld niet ziet is een optie om schoner vervoer, dus je transport, of milieuvriendelijk transport en dat je de klant daar extra geld voor vraagt.' | Aflevermogelijkheden
Kosten bezorging |
| Daar lobby ik weleens voor, maar dat is nog heel erg moeilijk bij marketeers en commerçanten, die zien dat nog niet zo, die zij nog niet zo overtuigd.' | Kosten doorberekenen
Consument |
| 'Precies, dat is wat zij zeggen, de klant is niet bereid daarvoor te betalen. Dan kom je in een soort kip-ei situatie.' | Consument
Kosten bezorging |
| 'Nou, ik denk dat wij een rol zouden hebben als bedrijf om daar ook, hoe moet je dat zeggen, mee te helpen opvoeden is een zwaar woord, maar die andere mogelijkheid moeten bieden en dat doen we nu niet.' | Consument betrekken
Verduurzaming |
| 'Er is een probleem gewoon, dat het zo ontzettend duur is.' | Kosten EV's |
| 'Daar komt nog bij dat sommige dingen in het proces zich wat moeilijker laten inregelen, elektrische auto's moeten worden opgeladen, dat opladen gaat niet in een paar minuten, zoals je met een brandstofauto natuurlijk wel gewend bent.' | Gebruik EV's |
| 'En dat is soms best lastig, dat betekent dat die auto's een groot deel van de dag niet inzetbaar zijn. Dat is wat je ziet waar we naar streven, dat we ‘s nachts veel verkeer tussen de sorteercentra en allebei units hebben, als iedereen ligt te slapen. Overdag hebben we veel transportbewegingen naar de klant. Dus we proberen de auto’s zo maximaal mogelijk in te zetten.' | Kosten EV's |
| 'Maar goed, aan de andere kant, elektrische auto’s hebben ook enorme voordelen, daar zijn we ons ook van bewust. Een pilot bijvoorbeeld, nou de Waddeneilanden gaan we allemaal elektrisch maken. Ameland en Terschelling, die zijn al volledig elektrisch. Nou dat past helemaal in het beeld, daar komen toeristen naar toe en die komen daar voor de rust en voor het mooie gebied.' | Voordelen EV's |
| 'We zouden dolgraag alles elektrisch doen, maar het is nog steeds heel duur.' | Kosten EV's |
| 'Alleen als je daar andere voordelen tegenover krijgt, kijk als je de binnenstad niet in mag om te laden en lossen tussen zeven uur ‘s morgens en vijf uur ‘s middags en je bent daarvan ontheven met een elektrisch voertuig, dan wordt het, hoe moet ik dat zeggen, kan het businessmodel anders worden.' | Beleid
Bezorging
EV's |
| 'Dat je vaak ziet dat dit soort maatregelen, die legt de gemeente op, die voert de gemeente uit. En de verschillende gemeentes die willen nog weleens verschillen strategieën hanteren, er zijn steden die inzetten op waterstof en er zijn steden die inzetten op elektrisch.' | Beleid verschilt per stad |
| 'Maar wat je gewoon merkt is dat die steden onderling ook eigenlijk heel slecht afstemmen en een beleid hebben over hoe ze dat willen aanpakken.' | Samenwerking steden onvoldoende |
| 'Het moet niet zo zijn dat een stad vandaag subsidie geeft als je rijdt op aardgas of op bio-aardgas. En een halfljaar later stoppen ze met die subsidie en twee jaar later zetten ze vol in op elektrisch.' | Beleid
Subsidieregeling |
| 'Als je bepaalde ontwikkelingen wil afdwingen in deze Regulering' |
maatschappij, dan moet je er een prijskaartje aan hangen, de vervuiler betaalt. En Nederland betaalt die niet, want wij zijn een land van ondernemers en mensen die graag willen handelen en iedereen moet erbij kunnen horen.’

‘Wij zitten in shopping2020, daarin is een platform en daar hebben wij bijvoorbeeld studie gedaan naar the last mile delivery. Maar daar gaat het eigenlijk over een breder belang, wat alle webshops hebben.’

‘Als jij heel efficiënt een vrachtauto kunt voldoen en ieder huis van al zijn behoeften kunt voorzien en dat maar een keer in de week hoeft te doen. Dan kan het ondanks dat een hele grote vrachtauto is, per item een ontzettende milieuwinst opleveren.’

‘Het grote voordeel is, hoe meer er online besteld wordt, hoe efficiënter uiteindelijk het transport. […] een zelfde redenatie geldt voor E-commerce bestellingen, hoe meer mensen daar gebruik van maken, hoe meer stops je hebt, hoe efficiënter de CO2 per pakketje is.’

‘Maar dat is juist goed want dat komt juist door deze ontwikkeling die ik hier beschrijf. Dat denkt van, waarom doe je het op de manier zoals je het doet. Ja, omdat wij een groot bedrijf zijn, hebben wij het altijd zo gedaan. […] Dan krijg je kleine start-ups en innovators en die kunnen dat veel slimmer en beter.’

‘Ik denk dat laatste en ik denk ook vanwege het enorme succes.’

‘PostNL is heel succesvol op de Belgische pakketmarkt. En waarom is PostNL daar zo succesvol, omdat als een Belgisch klant een product in Nederland besteld, dan heeft die het de volgende dag in huis. En de Belgische webshops die lopen nog wat achter.’

‘Subsidies zijn niet voor de eeuwigheid, daar ben ik het helemaal mee eens, maar het wordt te slecht aangegeven hoe lang een bepaalde subsidie er zal zijn.’

Afdwingen verduurzaming

Samenwerking webwinkels

Efficiency

Volume

Subsidies
### Vragen in het Nederlands

<table>
<thead>
<tr>
<th>Nummer</th>
<th>Vraag</th>
<th>Question in English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hoe vaak laat u online gekochte producten / goederen bezorgen?</td>
<td>How often do you let online purchased products / goods deliver?</td>
</tr>
<tr>
<td>2</td>
<td>Lettende op het antwoord wat u heeft gegeven bij de vorige vraag; kunt u aangeven of uw bestelgedrag in de afgelopen 5 jaar is veranderd?</td>
<td>Paying attention to the answer you gave to the previous question; Can you indicate whether your order behavior has changed in the past 5 years?</td>
</tr>
<tr>
<td>3</td>
<td>Welke online gekochte producten laat u bezorgen?</td>
<td>Which online purchased products will you deliver?</td>
</tr>
<tr>
<td>4</td>
<td>Wat is (of wat zijn) voor u de belangrijkste afweging(en) om producten bij een webwinkel te kopen in plaats van in een fysieke winkel?</td>
<td>What is (or what are) the most important consideration(s) for buying products from a web store instead of a physical store?</td>
</tr>
<tr>
<td>5</td>
<td>Geef aan van welke bezorgmethoden u gebruik maakt bij het online kopen van producten</td>
<td>Indicate which delivery methods you use online purchase of products</td>
</tr>
<tr>
<td>6</td>
<td>De volgende stellingen gaan over uw beweegredenen omtrent keuzes voor afleverlocatie en aflevermogelijkheid</td>
<td>The following statements are about your motives regarding choices for delivery location and delivery option</td>
</tr>
<tr>
<td></td>
<td>- Een webwinkel komt meer betrouwbaar over als ik een keuze heb tussen een aantal afleverlocaties.</td>
<td>- A web store is more reliable when I have a choice between a number of delivery locations.</td>
</tr>
<tr>
<td></td>
<td>- Ik bestel eerder producten bij een webwinkel die meer afleverlocaties aanbiedt.</td>
<td>- I would rather order products from a web store that offers more delivery locations.</td>
</tr>
<tr>
<td></td>
<td>- Als ik bij een webwinkel een afleverlocatie kan kiezen, zal ik daardoor eerder opnieuw een aankoop doen bij deze webwinkel.</td>
<td>- If I can choose a delivery location at a web store, I will make another purchase at this webshop.</td>
</tr>
<tr>
<td></td>
<td>- Voor mij is het waardevol dat ik bij een webwinkel tijdens het bestelproces de keuze voor de afleverlocatie kan bepalen.</td>
<td>- For me it is valuable that I can determine the choice of delivery location at a web store during the ordering process.</td>
</tr>
<tr>
<td></td>
<td>- Het kunnen kiezen van een afleverdag tijdens een online aankoop is voor mij waardevol</td>
<td>- Choosing a delivery day during an online purchase is very useful to me.</td>
</tr>
<tr>
<td></td>
<td>- Als ik bij een webwinkel geen aflevermoment kan kiezen, koop ik mijn volgende product liever ergens anders.</td>
<td>- If I cannot choose a delivery time at a web store, I prefer to buy my next product somewhere else.</td>
</tr>
<tr>
<td>7</td>
<td>De volgende stellingen gaan over de bereidheid om te betalen voor de snelheid en keuze in aflevering</td>
<td>The following statements are about the willingness to pay for the speed and choice in delivery</td>
</tr>
<tr>
<td></td>
<td>- Ik ben bereid om extra te betalen als ik mijn bestelling nog dezelfde dag geleverd krijg.</td>
<td>- I am willing to pay extra if I receive my order the same day.</td>
</tr>
<tr>
<td></td>
<td>- Ik ben bereid om extra te betalen indien een webwinkel meer aflevermogelijkheden biedt.</td>
<td>- I am prepared to pay extra if a webshop offers more delivery options.</td>
</tr>
<tr>
<td></td>
<td>- Ik ben bereid om extra te betalen indien ik online gekochte producten een uur na bestelling. geleverd krijg.</td>
<td>- I am willing to pay extra if I buy products online one hour after order. delivered.</td>
</tr>
<tr>
<td></td>
<td>- Ik ben bereid om extra te betalen indien online gekochte producten binnen een door mij opgegeven tijdslot worden geleverd.</td>
<td>- I am willing to leave extra if online purchased products are delivered within.</td>
</tr>
<tr>
<td></td>
<td>- Ik ben bereid om extra te betalen indien de webwinkel een duurzame bezorgmethode garandeert.</td>
<td>- I am willing to pay extra if the webshop is a sustainable delivery method.</td>
</tr>
<tr>
<td>8</td>
<td>De volgende stellingen gaan over uw standpunten ten aanzien van de bezorging van</td>
<td>The following statements are about your viewpoints regarding the delivery of online</td>
</tr>
</tbody>
</table>
online aankopen
- Ik sta stil bij de milieu-impact die voortkomt uit het doen van online aankopen.
- De toename van het aantal bezorgingen tasten de leefbaarheid in mijn buurt aan.
- Ik ontvang mijn online aankopen liever een dag later als de milieu-impact hiermee verlaagd kan worden.
- Ik kies mijn aflevermoment en afleverlocatie met zorg uit, om te voorkomen dat de bezorger voor een dichte deur komt te staan.
- Ik zie in mijn buurt graag meer afhaalpunten (pick-up points) verschijnen.
- Ik hou er, in het geval ik bij meerdere webwinkels aankopen doe, zoveel mogelijk rekening mee dat ik de bestelling op dezelfde dag plaats.
- In mijn buurt zijn voldoende afhaalpunten (pick-up points) beschikbaar.

9 Wat is (of wat zijn) voor u de belangrijkste overweging(en) bij het selecteren van de afleverlocatie?

10 Hoe waarschijnlijk acht u in de toekomst één van de volgende aflevermethoden te gebruiken?

11 Wat is uw geslacht?

12 Wat is uw leeftijd?

13 Wat is uw woonplaats?

14 Wat is uw hoogst afgeronde opleiding?

15 Hoe ziet uw gezinssituatie er uit?

16 Heeft u vragen en opmerkingen voor wat betreft (het vervolg van) het onderzoek?

I consider the environmental impact that comes from making online purchases.
- The increase in the number of deliveries affect the quality of life in my neighborhood.
- I prefer to receive my online purchases a day later if the environmental impact can be reduced.
- I choose my delivery moment and delivery location with care, to prevent the deliveryman from standing in front of a closed door.
- I would like more pick-up points to appear in my neighborhood.
- In case I make purchases from several online stores, I will take into account as much as possible that I place the order on the same day.
- In my neighborhood, sufficient pick-up points are available.

9 What is (or what are) the most important consideration (s) for you when selecting the delivery location?

10 How likely do you expect to use one of the following delivery methods in the future?

11 What is your gender?

12 What is your age?

13 What is your residence?

14 What is your highest level of education?

15 What does your family situation look like?

16 Do you have any questions or comments regarding (the continuation of) the research?