

Nijmegen School of Management

Spatial Planning: Urban and Regional Mobility

Urban distribution hub policy design

Combining hub user requirements with municipal distribution visions

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October 2021

Radboud Universiteit



Master Thesis

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October 24, 2021

Master Thesis Spatial Planning

Urban and Regional Mobility

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Word count chapter 1-7:

34.204

Summary

Over the last few years, urban logistics has grown rapidly. This urban logistics system is needed to fulfil the needs of urban economic development, but at the same time, the traffic that is complementary to urban logistics has direct effects on the living environment in the cities too. This provides municipalities with a dilemma: on the one hand municipalities want to provide the city in its economic growth, but on the other hand the liveability of the inhabitants of the cities is an important theme as well.

There are multiple ways to reduce the negative externalities and still leave room for economic growth in the city. Together with the implementation of zero emission zones, urban distribution hubs can help reducing the negative effects of urban logistics. This research will focus on the way that municipalities can facilitate the use of urban distribution hubs and how they can implement this in their policies. For this urban distribution hub policy design, views from urban distribution hub users themselves are also included, as they might provide practical and useful insights. The research' focus is on municipalities that are planning to implement a zero emission zone in 2025, which ensures that the municipal visions towards these zones can be included as well.

This research contains three sub-questions. While the first one is focusing on the usage requirements, the second sub-question tries to analyse the municipal visions on hubs. The third question tries to bring these two sides together and find opportunities to implement hubs more efficiently. To answer these questions, 19 interviews are conducted. Eight of these are held with hub users, while local governments were interviewed in the other eleven.

By conducting interviews with municipalities, it became clear that municipalities mostly do not have complete hub policies (yet). However, municipalities are already taking measures to facilitate hubs to a certain extent. These measures differ quite a lot from municipality to municipality. To form hub policies, first of all the main policy aim or overall focus has to be determined. From that, more specific objectives can be drafted, which can be split into smaller policy measures or targets. For urban consolidation centres, creating a starting volume or bringing parties together are useful measures. When it comes to dedicated hubs, focussing on brownfield developments seems to be an option. A policy framework regarding hubs can help steering towards these brownfield developments, instead of allowing them to build on greenfield locations.

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List of abbreviations

B2C	Business to Consumer
CO ₂	Carbon Dioxide
EV	Electric Vehicle
FTL	Full Truck Load
GDZES	Green Deal Zero Emissie Stadslogistiek (Green Deal Zero Emission City Logistics)
GHG	Green House Gas
ICT	Information and Communication Technology
LTL	Less Than (truck)Load
P&R	Park and Ride
PC-UDH	Private Company-Urban Distribution Hub
PP-UDH	Public-Private Partnership-Urban Distribution Hub
UCC	Urban Consolidation Centre
UDC	Urban Distribution Centre
UDH	Urban Distribution Hub
UFCC	Urban Freight Consolidation Centre
UFT	Urban Freight Transport
VKT	Vehicle Kilometre Travelled
ZE zone	Zero Emission zone
ZLB	Zuid-Limburg Bereikbaar

1 Introduction

Over the last few years, urban logistics has grown rapidly. The amount of goods coming into cities has grown a lot since the last five years, especially due to the increasing amount of e-commerce parcels and deliveries in urban areas and the economic growth over the last few years (Siegfried et al., 2021). This economic prosperity made cities more dependent of the provision of goods and its urban logistics system (Li et al., 2020). This urban logistics system is needed to fulfil the needs of urban economic development, to ensure continued quality of life in urban areas (Savelsbergh & Woensel, 2016). At the same time, the traffic that is complementary to urban logistics has direct effects on the living environment in the cities too (Melo & Baptista, 2017). Especially in the recent years, the ongoing development of urban logistics has increased the negative impacts, such as traffic congestion and pollution (Zhang et al., 2019). This has faced municipalities with a dilemma: on the one hand municipalities want to provide the city in its economic growth, but on the other hand the liveability of the inhabitants of the cities is an important theme as well (Marin, 2020).

Products and goods are being distributed from all over the country, continent or even the world, to eventually end up at a shop or at a customer's house. This last phase of the distribution process, in which the products are distributed within urban areas, is being referred to as last mile logistics. Together with first mile logistics – which works exactly the other way around – last mile logistics forms urban distribution (Lagorio et al., 2016). It contains all distribution phases that take place in and around the city. While the global distribution process is quite efficient, last mile logistics make up for a relatively huge part of the distribution's costs and environmental damage. There are different studies which estimate the costs of last mile delivery, but they differ a lot. Some studies estimate the last mile delivery costs at 28% of the total delivery costs (Ranieri et al., 2018), others claim that the last mile delivery can be accounted for more than 50% (Graham et al., 2019) or even up to 75% (KiM, 2015) of the total logistics costs. Urban logistics has quite an impact on the urban environment too. Freight transport has a 25 percent share in the total amount of carbon dioxide (CO₂) emission in city traffic (ALICE/ERTRAC, 2014) and 19% of the energy use (Russo & Comi, 2012), which makes the last mile the most polluting section of the entire logistics chain (Gevaers et al., 2011). On top of these negative aspects, urban freight transport also leads to other problems such as congestion, road casualties, visual intrusion and noise pollution (Anderson et al., 2005; Kin et al., 2017).

Municipalities are trying to find ways to reduce these negative impacts, while not hindering the chances for urban economic growth. A possible way to do this, is by encouraging the use of electric vehicles (Quak et al., 2016). In the Netherlands, more than 30 municipalities have chosen this approach to improve the quality of life in the cities. These cities are collectively taking part in the Green Deal Zero Emission City Logistics (GDZES) project (Den Boer et al., 2017), expressing that they will strive for ZE zones (ZE zones) by 2025. Their approach is to implement a ZE zone, which only allows electric freight vehicles in the city centres from 2025 onwards (Quak et al., 2020).

Another way to reduce the negative externalities of urban distribution, is by setting up urban distribution hubs (Browne et al., 2005). These hubs are mainly located on the edge of the city and add another stop in the distribution process. Goods from outside the city will be distributed to these hubs, where they will be transferred to other vehicles. These often smaller vehicles will distributed the goods into the city and deliver the products at shops and customers houses. The profit in this process comes from the principle of bundling: products from outside the urban area are bundled –

or: consolidated – and are brought into the city with fully loaded trucks or vehicles (Hesse & Rodrigue, 2004).

In the last few years many of these urban distribution hubs have come to existence in Europe and the Netherlands. This is mainly due to the population growth, urbanisation and the increased use of online shopping (Zissis et al., 2018). In Dutch cities where a ZE zone will be implemented in 2025, these hubs contribute to another cause. Since conventional vehicles are not allowed in the city centres from 2025 onwards, goods can be bundled at these hubs and delivered into the city centres by electric vehicles. So, for municipalities with a ZE zone, these hubs might have a greater chance of being able to make a change in urban distribution (Quak et al., 2020).

1.1 Research Objective

This research will focus on the way that municipalities can facilitate the use of urban distribution hubs. Together with the implementation of the ZE zone, these hubs can reduce the environmental impact of urban distribution, while it still can fulfil the economic needs of its municipality. This research will analyse municipalities that are implementing a ZE zone. The municipalities that are implementing the ZE zone mainly are the ones with cities with relatively much inhabitants. For smaller municipalities, the negative externalities of urban distribution might not be that big of a problem, or the costs of implementing a ZE zone are too high. By focussing on cities with ZE zones, chances are higher that these cities have a view on urban distribution, and on urban distribution hubs as well. After all, the implementation of a ZE zone is already a decision that affects urban distribution.

Most municipalities are willing to make a change in urban distribution and reduce the environmental impact. Municipalities welcome the emergence of urban distribution hubs and try to be in some way assisting to find suitable locations or provide financial aid. However, companies still encounter difficulties when setting up urban distribution hubs. In some cases hubs are struggling financially, or they cannot find any suitable location. The aim of this research is to find what the user requirements of urban distribution hubs are and how this can help local governments in creating urban distribution hub policies, together with their own ideas and visions towards urban distribution. Therefore it is necessary to know what the current stance of municipalities on urban distribution is and how hub users see the possibilities for efficient use of the available urban space.

1.2 Research Question

The question this research aims to answer is *‘How can the usage requirements of urban distribution hubs and the hub visions of local governments be combined to form clear and realistic hub policies?’*.

Three sub-questions have been formulated to answer this main question. The first sub-question examines the user requirements of urban distribution hubs: *‘What are the usage requirements for urban distribution hubs?’*. In this sub-question, deeper insights will be provided in the conditions that hub users set for their hubs. This includes building and location requirements, as well as possible desired support from local governments.

The second sub-questions elaborates on the visions of local governments. In the case of this research, this will be Dutch municipalities of large and medium size that are implementing a ZE zone. The second sub-question therefore is *‘What are the current hub policies of Dutch municipalities that are implementing a ZE zone?’*. In this sub-question, the current vision of municipalities on urban

distribution hubs and the measures they are taking at the moment will be discussed. Also, their view towards future hubs and hub policies shall be discussed, together with the connection between the implementation of a ZE zone and their hub visions.

The third and last sub-question examines the possibilities to implement urban distribution hubs in a more efficient way when it comes to the use of urban space. The available land in cities is becoming scarce and municipalities have to consider which functions are desirable in their municipality. If urban distribution hubs can be implemented more efficiently, the chance of finding a place in the crowded city could be increased. The third sub-question therefore is *'What are the opportunities for a more efficient implementation of urban distribution hubs?'*.

1.3 Societal Relevance

In 2025, a lot of Dutch municipalities – especially the larger and medium-sized cities – are planning to introduce ZE zones in their city centre areas (Den Boer et al., 2017). This means that only vehicles that do not emit polluting gasses may enter certain areas in the city, particularly city centres. In fact this means that only (hydro-)electric vehicles are allowed. Currently the urban distribution is mostly done by small freight vehicles, which enter the city just to stock one specific shop. Quite often these vehicles are not fully loaded, which means that the delivery process is not as efficient as possible. Due to the implementation of the ZE zones, local entrepreneurs and shop owners have to change the way of distribution. In this process of change lie some chances to make the delivery process more efficient and sustainable.

In the first place, the urban distribution has to be done by sustainable vehicles from 2025 onwards. Entrepreneurs may choose to change their fleet from petrol vehicles to electric vehicles and do the delivery process in the exact same way as before. This makes the delivery process more sustainable, but it does not make it more efficient. In order to make that happen, entrepreneurs can also choose to make use of urban distribution hubs. The entrepreneurs bring their goods to a hub outside the ZE zone, from which multiple goods can be combined and brought to the city centre with electric vehicles. In the case of using the urban distribution hub, the delivery process not only becomes more sustainable, but it becomes more efficient too.

This research aims at making it more clear for municipalities what the impact of implementing an urban distribution hub will be. By providing this clearer view, municipalities can make a better balanced decision about implementing a hub. Besides that, this research will investigate the ways in which an urban distribution hub can be implemented more efficiently, on the scale level of the hub itself. These insights can contribute to a smarter use of available urban plots. Overall, this research will provide handles for municipalities to facilitate urban distribution hubs. In this way they can help setting up hubs more easily – if municipalities want to. As stated earlier, urban distribution hubs can contribute to a more sustainable and efficient way of the urban distribution process. If hubs can be implemented more easily, it leads to a more sustainable and efficient urban distribution process, that helps reducing negative externalities of urban logistics. The societal relevance therefore is that this research aims to provide a clear overview of the way hubs can be implemented, so municipalities can use these insights to create a more sustainable and efficient way for urban distribution.

1.4 Scientific Relevance

In the existing literature, urban distribution hubs are not a new phenomenon. A lot of articles can be found on hubs, especially on the financial implementation of urban distribution hubs and location choice for these hubs. The financial implementation of urban distribution hubs is most relevant for urban consolidation centres. In these centres, goods of different distributors are bundled and delivered to the city centre in one vehicle. Financial feasibility studies on urban consolidation centres are for instance done by Duin et al. (2016), Janjevic and Ndiaye (2017) and Nordtømme et al. (2015).

Studies specifically on location are covered for a broader spectrum of urban distribution hubs. Although more studies can be found on this sub-topic of urban distribution hubs, the focus of location studies is mostly on the user's perspective. Many examples of location choices of micro agents can be found, such as Alho et al. (2017), Kuo et al. (2009), Liedtke (2009) and Roorda et al. (2010). This might seem understandable, since most users determine where they are going to build their hubs, but the suitable plots for hubs are not always available. Especially in the Netherlands, there are a lot of spatial claims on limited space. Most of the urban hub users have to settle for a less optimal location, because the best locations are simply not available.

This research focusses on the municipal decisions regarding urban distribution hubs. While the financial implementation of hubs and the location choice focus on the private aspect of hubs, this research' focus is also on the public aspect of hubs. The way municipalities can facilitate hubs and make hub policies is a key subject in this research. The previously mentioned topics are useful for this research though, since the urban hub user aspect will provide input as well. However, finding the most optimal location and a suitable business case might not be the only issues that urban distribution hub entrepreneurs are facing. For example, finding a location might be a struggle in the first place, let alone finding an optimal location.

This research will try to provide new insights for both public decision makers (municipalities) and private urban distribution hub users (or entrepreneurs). Besides, it will try to connect the users' requirements with the municipalities' aims and visions towards urban distribution and its hubs. The scientific relevance therefore is that this research aims to fill the research gap on required space for urban distribution hubs on the one hand, and contributes to the literature on municipal decision making regarding urban distribution hubs on the other.

2 Theoretical framework

This chapter discusses the available literature that fits within the scope of this research. In the first paragraph, urban freight and urban distribution in general will be discussed. The second paragraph focusses on urban distribution hubs. The main theory – public policy design – that will be used in this research will be specified in paragraph three. Paragraph four is the final part of this chapter, in which the conceptual model will be explained.

2.1 Urban distribution

This sub-paragraph explores freight transport in the urban context. Urban freight transport or urban distribution is beneficial for a city, though it brings negative externalities. This sub-paragraph contains an overview of the urban freight paradox and the negative externalities it brings, as well as ways to deal with these externalities – for instance by implementing ZE zones.

2.1.1 Urban Freight Paradox

When it comes to urban logistics and urban distribution, Semanjski and Gautama (2019) - among others - underline a paradoxical connection between the city and its logistics: Cities strongly rely on efficient urban logistics for the cities' attractiveness, economy and life quality. At the same time, the constantly increasing number of freight vehicles movements - which provide the city its goods - raises questions regarding environmental impact, thus affecting the quality of life in a city. Although the city needs its goods, the vehicle movements that are necessary for the supply of them seem undesirable. An efficiently working urban freight transport (UFT) network ensures that cities can take advantage of the benefits, instead of having to contend with the negative consequences. In addition, the bigger the cities' population, the more dependent a city is on an efficient transport network (Dablanc, 2007). Businesses themselves profit from an efficient network, because they have to be able to send and receive their shipments on time (Ballantyne et al., 2013). Local authorities also recognize that a well working transport network is beneficial for their city, since the businesses in their city contribute to their economic prosperity (Anderson et al., 2005).

2.1.2 Negative Externalities

In bigger cities, urban centres are the places with a higher degree of congestion and higher land values, thus higher land prices. As a result, there has been a "movement of logistics facilities away from urban centres", called logistics sprawl (Dablanc et al., 2014). The relocation of logistics facilities away from the city centres leads to an increase in vehicle-kilometre-travelled (VKT), resulting in some negative effects. The increase in VKT leads to traffic congestion, more carbon emissions and local air pollution, as well as infrastructural damage and traffic accidents (Sakai et al., 2017).

It is clear that urban logistics have some kind of negative impact on the city. Some of the aspects are negative for the actual users of the urban logistics network themselves. Traffic congestion, for instance, is partly caused by urban distributors, while the effect (extra travel time) is negative for the distributor itself. Most of the negative effects have some result on actors that are not directly involved in the urban distribution network. These effects are called negative externalities and are problems such as more carbon emission, noise and air pollution, visual intrusion, infrastructural damage and road casualties (Anderson et al., 2005; Kin et al., 2017). To some extent, traffic congestion is a negative externality too, because some road users that are effected by the congestion, do not have direct involvement in urban distribution.

The impact of urban logistics – or city logistics – is becoming bigger over the recent years, which leads to an increased presence of negative externalities. Cities have been getting becoming denser with the enormous increase of freight transport (Agrebi et al., 2015). A factor that has quite an impact on urban freight and urban distribution is the grow of e-commerce. Due to the growing e-commerce market, more parcels are delivered at the consumer's home address. Most of this so called last mile delivery is done by a big amount of vans in urban. First of all, most of the time the vans are badly loaded, so more vans are driving around than needed. Secondly, often the consumer does not seem to be home, so the vans are driving around useless. Higher congestion and pollution rates can be directly linked to these lower fill rates and an increase in total distance travelled by freight vehicles (Verlinde, 2015). Besides that, the vehicle flow increases due to the increasing returns (Raad voor de Leefomgeving en Infrastructuur, 2013). These factors, combined with global urbanization, lead to more flows of urban freight traffic, which lead to more greenhouse gas emission, traffic congestion, noise and air pollution and higher delivery costs (Faugere & Montreuil, 2017). This phenomenon will only grow every year. A city of 100,000 inhabitants for example, will have an increase of more than a thousand vehicles per day in the next few years (Buck Consultants International, 2013).

2.1.3 Trias Mobilica

In 1996, Lysen (1996) introduced a strategy framework, in which he describes how to reach sustainable energy use. He named his three-step strategy after Montesquieu's 'Trias Politica' of 1752, namely 'Trias Energica' (Entrop & Brouwers, 2010). These three steps are prevention, renewable and efficiency. Lysen himself did not put a hierarchy to these three steps, but since Hestnes (2001) referred to the Trias Energica – or Trias Energetica – as a hierarchal approach, the Trias Energica framework is seen as such (Entrop & Brouwers, 2010). The first step in reducing energy use, or being sustainable with energy use, is prevention. Energy use should be reconsidered and preferably reduced or prevented. If it is not possible to reduce energy use, one should make use of renewable energy resources as widely as possible. When that is not possible as well, fossil fuels should be used as efficient as possibly can as a third step (Lysen, 1996). Chwieduk (2003), who used the Trias Energica in a housing study, states that three different indicators of houses could be formed depending on the step in the Trias Energica. Houses that only meet the third (and last) criteria, could be called energy efficient. When the second step criteria is met, houses can be called environmental friendly. Only when the first criteria of the Trias Energica is considered closely, houses can be classified as sustainable. Although used in a housing study, this classification could also be used in all other fields where energy use plays a role.

Lysen's Trias Energica namely is used in different fields of study, after which a new Trias-name is given to the three-step approach. For instance, Trias Toponoma covers the field of land-use, Trias Hydrica the aspect of water and Trias Hylica the aspect materials (Entrop & Brouwers, 2010). For sustainable transport the triad approach can be used as well, being the Trias Poreutica or – more common in the Netherlands – Trias Mobilica. The key of the Trias Mobilica connects to the idea of Newman and Kenworthy (1999) that sustainable mobility connects to a smaller dependence of automobility. The first step is the Trias Mobilica is the reduction of need for (motorized) transport. Walking or cycling should replace motorized transport, which can be done by shortening travel distances. The idea of a Compact City fits to this step. Step two entails that sustainable transport methods should be used. The general idea of this step is that public transport is the most sustainable way of transport, when walking or cycling is not possible. The third and last step of the Trias Mobilica

contains ways to make motorized transport as efficient as possible (Entrop & Brouwers, 2010). The use of electric vehicles fits in this category, as well as carpooling and the implementation of green waves. As Grebe et al. (2021) put it shortly: the three steps of Trias Mobilica are reducing, changing and cleaning.

The division of Grebe et al. (2021) are not entirely the same as the steps of Entrop and Brouwers (2010). Where Entrop and Brouwers (2010) put the change from motorized to non-motorized transport as their first step, this is included in the second aspect – modal shift – in Grebe et al.'s division. Their first aspect, reduction, focusses on the efficiency of the transport system: unnecessary transport movements should be avoided and the load factor of vehicles should be higher. In their study, Grebe et al. (2021) classified all kinds of transport policy measures in one or more of these Trias Mobilica aspects. ZE zones, for example, only contribute to making transport cleaner. Access restrictions lead to improvements in both reduction and changing transport, while the implementation of logistics hubs contribute to all three aspects (Grebe et al., 2021). These three aspects together form the Trias Mobilica pyramid, as can be seen in figure 1. Although reducing vehicle movements is first step of this pyramid, the chances of contributing to CO₂ reduction in mobility are the lowest. On the other hand, making vehicles cleaner can, although being the last step of the three, contribute to the highest amount of CO₂ reduction (Grebe et al., 2021).

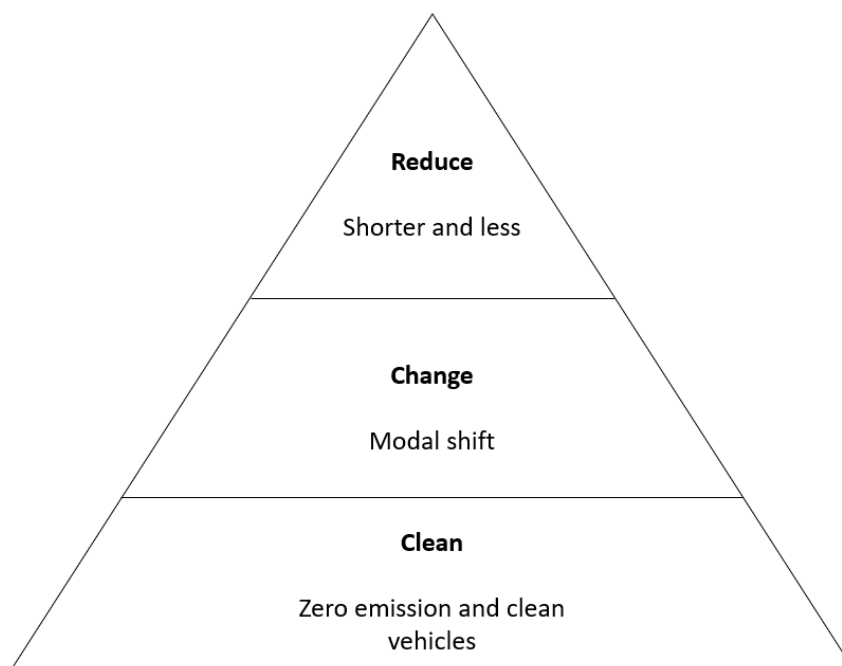


Figure 8 - Trias Mobilica pyramid. Based on Grebe et al. (2021, p. 50).

2.1.4 Urban Freight Transport Policies

To reduce negative externalities, local authorities make regulations in an attempt to steer UFT. A study by Akgün et al. (2019) showed that many cities have high-level goals to reduce the impact of externalities. They aim for emission and congestion reduction and improvement of quality of life, while they want to support the local economy as well. In most of their cases however, these general goals were not broken down into clear objectives with measurable targets. Although some UFT policy was made, for instance by setting up primarily access restrictions such as time windows or weight

restrictions, their objectives were not monitored. In most cases it did not become clear whether or not the objectives were achieved.

On top of that, it is possible to observe an increasing “urban mobility gap” (European Commission, 2013). Some cities are advanced in implementing UFT policies and stand out as far as the level of progress, but the majority have none or negligible experience with UFT policies (Kiba-Janiak, 2017). In a survey held by the European Commission (2013), respondents believed that local authorities should be responsible for the road and traffic reduction (both passenger and freight) in the city. However, most of the cities’ transport policies concentrate on public transport and infrastructure, but not about UFT (Lindholm & Browne, 2013). Especially in the city development strategies of the new member states of the EU, freight transport is hardly or not taken into consideration at all (Witkowski & Kiba-Janiak, 2014). In western Europe, mainly the bigger cities have strategic goals in the field of urban freight transport, for instance London, Amsterdam, Copenhagen, Stockholm, Gothenburg and Barcelona (Dablanc, 2007).

Closing the “urban mobility gap” is important to deal with the negative externalities of UFT. A way to deal with these effects is making policies concerning UFT (Kiba-Janiak, 2017). When local authorities attempt to make policies concerning UFT, they require long-term goals. Present needs of the urban transport system are important, but future trends and changes should be included as well (Iwan & Kijewska, 2014). Kiba-Janiak (2017) identifies at least five trends and changes that must be taken into account when making transport policy:

- Challenges concerning environmental protection: reducing the negative impact of the transport sector on the environment;
- An increasing shortage in fossil fuels: the necessity of the transformation to a low-carbon economy;
- The growing population in cities, which will cause an increase in the demand for urban freight transport;
- The increase in innovative and ecological solutions: a wider access to advanced technology and EU requirements concerning environmental protection ensure that transport companies will make more use of innovative and ecological means of transport, e.g. electric vehicles;
- The development of solutions in the field of information and communication technology (ICT).

2.1.5 Emission Free City Logistics

The European Commission (2011) recognizes the need to reduce the negative impact of urban freight. In 2011, it set a goal of achieving CO₂-free city logistics by 2030, in order to improve the quality of life in major urban centres. In The Netherlands specifically, large cities are collectively taking part in the Green Deal Zero Emission City Logistics (GDZES) project, in which they strive for zero emission city logistics (Den Boer et al., 2017). The GDZES is an agreement between a coalition of companies, civil society organisations, and local authorities. In the Dutch climate agreement, more than 30 cities have set zero emission city logistics as an objective (Quak et al., 2020). The implementation of a ZE zone is the specific measure that should help these municipalities reach zero emission city logistics. Currently, 26 municipalities have decided to implement a ZE zone in 2025 (*ZES partners*, n.d.). The division of these municipalities across the Netherlands can be seen in figure 2.



Figure 2 - Municipalities implementing a ZE zone in 2025 (own work, based on ZES partners (n.d.))

The use of zero emission vehicles is considered as one of the main directions on how to reduce the negative impacts from transport in cities while maintaining an efficient urban freight transport system (Quak et al., 2016). Electric Freight Vehicles (EFVs) do not produce local emissions and have - depending on the way electricity is generated - a huge potential in the reduction of CO₂ emissions (Quak & Nesterova, 2014). A study on the ZE zone in Rotterdam in combination with Urban Consolidation Centres (UCCs) showed that this combination has an impact on the freight patterns in and around the city centre. Although emissions are reduced in the ZE zones, vehicle kilometres travelled outside the ZE zone increase (City of Rotterdam, 2019). Since logistic efficiency increases as well, as a result of improved consolidation possibilities, these higher vehicle kilometres travelled are compensated (De Bok et al., 2020).

2.2 Urban distribution hubs

In this sub-paragraph, theories about urban distribution and urban distribution hubs will be discussed. Firstly, the concept of urban distribution hubs will be explored, with a subdivision of different kinds of hubs. After that, the advantages and disadvantages for hub existence in the urban context are discussed and a definition for this research is given.

2.2.1 Two main types of urban distribution hubs

In the literature, multiple terms are used to describe an urban distribution hub (UDH). These hubs, which are also known as Urban Distribution Centres (UDCs), can roughly be divided into two types. The most common dichotomy is the distinction between hubs with one and hubs with more parties involved. If the carrier and the retailer are from the same company as the hub provider (e.g. supermarkets or postal companies), UDHs are differently set up and have different potential beneficiaries than if there are multiple actors involved (Browne et al., 2004).

The most covered of these two is an Urban Consolidation Centre (UCC) or Urban Freight Consolidation Centre (UFCC). These are centres where freight of different carriers is bundled and brought to the city in a combined delivery to multiple retailers. An example of a company providing this cross-docking in the Netherlands is Binnenstadservice (Quak et al., 2020). Because UCCs are the most covered type of UDHs, these two concepts are sometimes confused in literature (Tario et al., 2011). Some other concepts that could describe an UCC are an urban transshipment centre, a pick-up drop-off location and a shared-user urban transshipment depot, as well as an urban distribution hub itself (Browne et al., 2005). The second type of UDH is a hub, where the hub provider, as well as the carrier and the retailer are the same company. These hubs are hubs where a bigger vehicle delivers its goods, and a smaller vehicle brings it around the city. Although this type is less apparent in the literature, it is sometimes being referred to as *dedicated hub* (Zissis et al., 2018). These dedicated hubs are often used to cover orders from e-commerce.

For this research, the term urban distribution hub (UDH) is used as an umbrella term and can be divided into two types: urban consolidation centres (UCCs) and dedicated hubs. UCCs bundle goods of different companies together, while dedicated hubs only handle their own goods.

2.2.2 Other differences between hubs

There are some more differences that can be found within the range of urban distribution hubs. For instance, hubs can be a bottom-up or a top-down initiative. According to Quak (2008) bottom-up initiatives appear to be more successful, due to the involvement of the different actors since the beginning of the implementation. The involvement of both carriers and retailers from the beginning often results in a more stable financial hub organisation. Musolino et al. (2019) also identify two kinds of assets for , slightly overlapping with the dichotomy of Quak (2008). The different involved actors and different actors that are responsible for the delivery create the distinction between a Private Company-Urban Distribution Hub (PC-UDH) and a Public-Private Partnership-Urban Distribution Hub (PP-UDH). In PC-UDHs, both delivering activities and planning, financing and management are carried out by a private company. In PP-UDHs, these tasks are divided between a private company – accountable for the delivering activities – and a public-private partnership or public administration – being responsible for planning and financing.

Another important distinction between hubs is the sector or segment within which the hub operates. In some sectors there is a high potential for bundling and using an UDH, while others are not very suited for UDHs (Den Boer et al., 2017). Although there is consensus about the fact that there are differences between some sectors, sectors are not always distinguished the same. In Den Boer et al. (2017) for example, six different segments are mentioned, while Groen et al. (2019) identify nine segments. These segments all account for different emissions per activity, as can be seen in figure 3. This figure points out that the general cargo and retail, alongside with the construction logistics, are the segments with the highest amount of greenhouse gas (GHG) emissions. However, the parcels and temperature-controlled segments are expected to have a larger share in 2050. These two sectors are mainly using dedicated hubs as UDHs, whereas the most polluting segments – general cargo and construction logistics – seem to be the segments with the highest potential for the use of an urban consolidation hub (Den Boer et al., 2017).

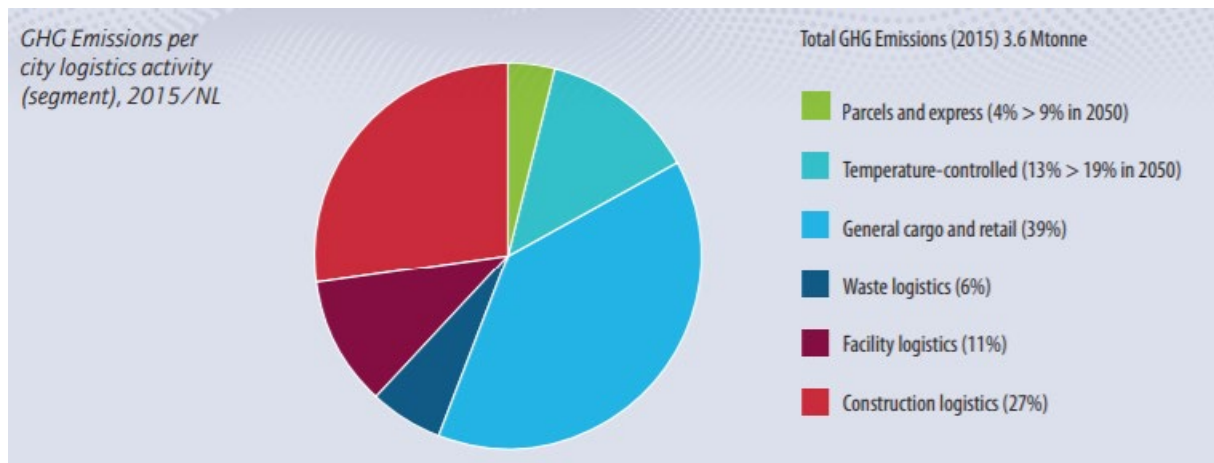


Figure 9 - GHG Emissions per city logistics activity (segment) in 2015 in the Netherlands (Den Boer et al., 2017, p. 6)

2.2.3 Advantages and thresholds

Browne et al. (2005) did an extensive study on urban consolidation centres (UCCs), in which they also include an urban distribution hub in their list of synonyms. They identified three aspects where the implementation of an UCC could have an advantage: storage space, transport features and pre-retail services. These three features lead to three main economic, social and environmental effects, which can be seen in figure 4. The main transport benefits of UCCs are mainly focussing on the consolidation of goods, leading to a reduction in vehicle trips, vehicle kilometres, and the ability to separate trunk movements from local deliveries, making the use of alternative modes and vehicle types more feasible (Browne et al., 2005).

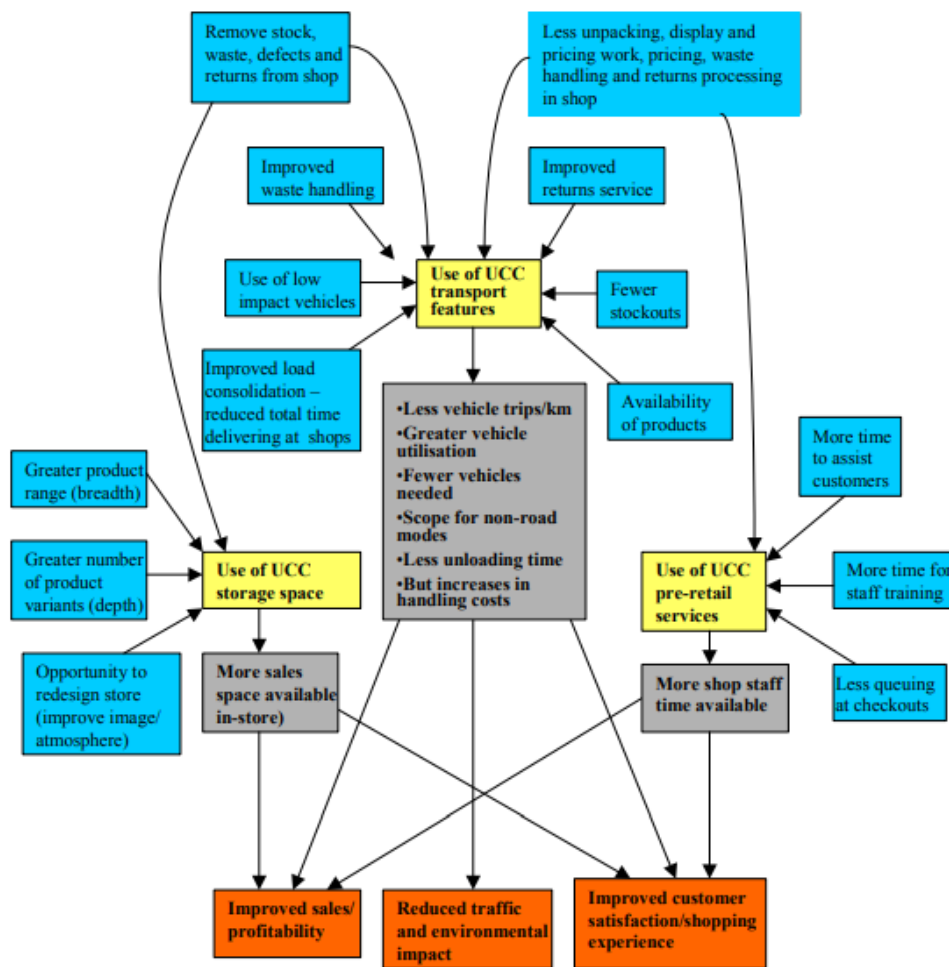


Figure 10 - Range of potential logistics and pre-retail activities at UCC and possible benefits (Browne et al., 2005, p. 10)

The potential benefits of UCCs are not the same in every sector. Retail stores are more likely to make use of UCCs, because they have lower delivery frequencies and are less time critical. Sectors with higher delivery frequencies and more time critical deliveries – for instance food shops and restaurants – are less likely to accept an additional transportation leg in their supply chain (Marcucci & Danielis, 2008).

The main disadvantages and thresholds include potentially high set up costs, organisational and contractual problems, potential creation of monopolistic situations and loss of interaction between suppliers and customers. Also some issues are mentioned in the case of one UCC being present in a city or urban area. A single UCC location is less likely to be attractive to all suppliers, due to the degree of diversion in routes from the supplier to their 'normal' delivery point. Besides that, due to the wide range of goods that are distributed to and from an urban area, a UCC has to have different kinds of handling and storage requirements for different kinds of goods (Browne et al., 2005).

2.2.4 Definition

This sub-paragraph is finalized with a definition. Since most urban distribution literature do not use a definition, not many definitions can be found in current research. Besides that, the available definitions about urban distribution hubs are in fact describing urban consolidation centres. Although the following definition also tends to describe a consolidation centre, it provides a good starting point for a definition:

“An urban distribution centre [or: urban distribution hub] is a facility involving the trans-shipment of goods directed to urban areas, aiming to consolidate deliveries, and thus provide greater efficiency in the distribution process by increasing the truck load factor and decreasing the number of trucks used, which help mitigate urban congestion and air pollution.” (Tario et al., 2011, p. 4).

Especially the focus on greater efficiency seems to be a right view on urban distribution hubs, although efficiency does not always have to be reached by decreasing the number of trucks. For dedicated hubs, for instance, distribution hubs are set up to reload freight onto smaller – and sometimes greener – vehicles. Also, the aim for consolidating deliveries and reducing congestion and pollution is not always the case, especially for dedicated hubs. Reducing negative externalities is a nice by-catch, but for dedicated hub organisations, reducing the transportation costs is their main objective. A new definition will be formed, combining the previous definition with the following statement of Russo et al. (2013):

“The presence of an UDC [or: urban distribution hub] allows shaping a new service in the urban freight distribution process, which allows freight to be carried by means of larger vehicles outside the city and, after the transshipment, by means of smaller and less polluting vehicles inside the city.” (Russo et al., 2013, p. 801).

I define an urban distribution hub in this research as follows:

“An urban distribution hub is a facility, involving the trans-shipment of goods from one vehicle – delivering goods from outside the urban area – to another vehicle – delivering goods inside the urban area, aiming to provide greater efficiency in the distribution process.”

2.3 Policy design

The last sub-paragraph of this chapter will describe the central theory of this research, the policy design theory by Michael Howlett. The different aspects of public policy design will be discussed in this sub-paragraph, as well as the different definitions that exist. The policy design theory will form the basis of the conceptual model, which will be discussed in paragraph 2.4.

2.3.1 Policy goals

One of the first researchers that focused on policy design, was Thomas Dye. He defined public policy quite simple as “what government chooses to do or not to do” (Dye, 1972). This already points out an important feature of policy design, namely that all policy is based on choices. Even when its decided to leave policies as they are, it still is a decision thus is policy design as well. This definition falls a little short in describing the content and process of public policy design, though. In 1958, Lasswell already pointed out that public policy design consists of two main components: policy goals and policy means. While policy goals are rather broad objectives, policy means are more specific (Lasswell, 1958). Walsh (1994) extended this dichotomy by Lasswell and noted that policy goals are the more basic and broad government goals or objectives, while the policy means are the exact

measures or techniques that governments apply to reach their policy goals. In other words, policy goals provide answers to a ‘what’ question, while policy goals are focussed on ‘how’ questions. The policy goal could be to create a liveable city centre, with a complementary policy mean that focusses on government style, for instance through a market governing style.

Howlett and Cashore (2009) deepened this ideas of Lasswell and Walsh. They also used the dichotomy of policy goals and policy means, but added three levels of abstraction to both of these concepts. This lead to a two-by-three table of public policy components, as can be seen in figure 5. According to Howlett and Cashore (2009), a single policy goal was too broad and needed some operationalization. A liveable city could be the highest level of abstraction in the case of the previous example, but policy design consists of more than a broad and general concept only. A policy regime or operationalization and programme settings were added in the policy design theory. This led to a division in policy aim, objective and target, each with a more specific level of abstraction (Howlett, 2019). A liveable city centre is in this case the policy goal with the highest level of abstraction. When operationalizing this, reducing vehicle movement in the inner city could be the objective, whereas the measure of fewer time windows for all motorized vehicles could be a specific policy target.

		<i>Policy level</i>		
		<i>Governance mode: high-level abstraction</i>	<i>Policy regime: programme-level operationalization</i>	<i>Programme settings specific on-the-ground measures</i>
<i>Policy component</i>	Policy goals	General abstract policy aims: The most general macro-level statement of government aims and ambitions in a specific policy area	Operationalizable policy objectives: The specific meso-level areas that policies are expected to address in order to achieve policy aims	Specific policy targets: The specific, on-the-ground, aims of efforts to achieve objectives and aims
	Policy means	General policy implementation preferences The long-term preferences of government in terms of the types of organizational devices to be used in addressing policy aims	Policy tool choices The specific types of governing instruments to be used to address programme-level objectives	Specific policy tool calibrations The specific ‘settings’ of policy tools required to implement policy programmes

Figure 11 - Components of public policies involved in policy design (Howlett & Cashore, 2009. In: Howlett, 2019, p. 45)

2.3.2 Policy means

The policy means for these three levels indicate the type of governing mode and tools that are used. For the highest level of abstraction, this means the long-term governance mode. This could for instance be market governance, hierarchical governance or network governance (Meuleman, 2011). The second level of policy means describes the policy tool choices or types of governing instruments. A lot of divisions exist for group types of instruments, but the division of Hood (1986) is the most common and most widely used. His NATO scheme divides the types of governing instruments into

four categories: Nodality, Authority, Treasure and Organization. Hood and Margetts (2007) visualized this classification, as can be seen in figure 6.

<i>Governance principle</i>	<i>Nodality</i>	<i>Authority</i>	<i>Treasure</i>	<i>Organization</i>
Basic resource	Information	Law	Money	Structures and capacity
Governance logic	Indirect stimulation of behavioural change through information and persuasion	Direct prescription of behavioural rules	Indirect stimulation of behavioural change through financial incentives	Provision of public good or service by the state or public enterprise
Typical instruments	Information campaigns	Prohibitions Bans	Taxes User charges	Public companies
	Suasion	Permits	Grants	
	Research inquiries	Standards	Tax deductions	

Figure 12 - Policy classification by governance principles (Hood & Margetts, 2007. In: Knill & Tosun, 2020, p.24)

Nodality refers to the role that governments have to distribute information. Governments have information and have the ability to choose whether they want to spread that information, and to whom. Examples of nodality are the publication of data and information, education, advice, recommendation and persuasion (Vedung, 1998). In the case of wanting to create a liveable city, education about the positive health impact of cycling and negative impact of cars could be tools to use as a government. Authority is the second category and is defined by the use of the law as a central resource for governmental intervention. Typical instruments that belong to this category are command-and-control instruments, demanding, forbidding, guaranteeing, and judging (Knill & Tosun, 2020). Denying access to motorized vehicles in inner cities fits in this category. The third category is treasure, which has everything to do with money and financial tools that governments have. Both rewards and fines belong to this category. Important for this category is that the addressees, or people involved by the measure, can choose whether they want to receive the reward or fine. A change in their behaviour could prevent them from the fine or can get them the reward (Knill & Tosun, 2020). Increasing parking costs in city centre parking garages could be an instrument that fits in this category. The last category is organization. Organization refers to the formal structures in order to achieve policy objectives. This means that governments directly produce a certain good or service themselves, which are known as public goods (Mayntz, 1979).

2.3.3 Policy design structure

While the dichotomy of Walsh (1994) already includes more policy design elements than Dye's (1972) definition, it generally still focusses on the content of public policy. This side of public policy design is known as substantive policy (Howlett, 2019). The other side of public policy, the procedural side, is also an important part of policy design. Again, Lasswell (1956) was one of the first to address this. He opted a policy cycle of seven different stages. His ideas were slightly developed and restructured by other authors during the next decades, but his original idea of a policy cycle or circle still remained. Even in more current work, 'applied problem solving' still is the main idea behind the cycle (Hill & Hupe, 2006). The policy cycle is nowadays reduced to a five-stage cycle, among others in the work of Howlett (2019). The 'standard model' of the policy cycle can be seen in figure 7.

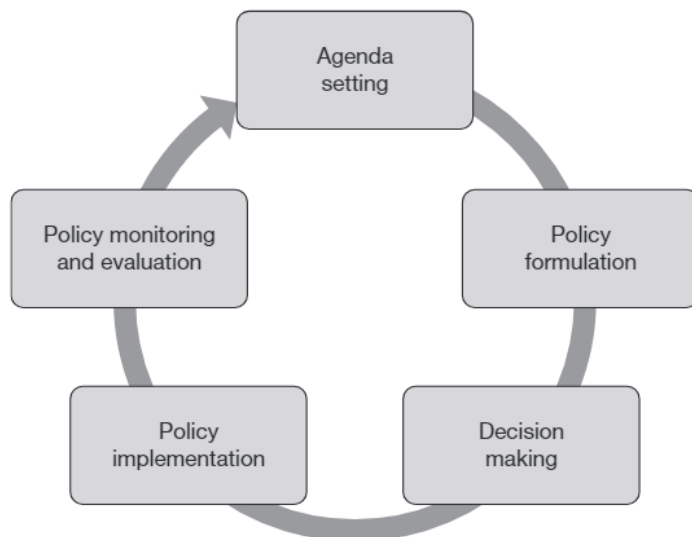


Figure 13 - The five stages of the policy cycle and their relationship to applied problem-solving (Howlett, 2019, p.47)

The policy cycle starts with agenda setting. This refers to the stage where the problem occurs and becomes a point of interest for the government. Policy formulation is the second stage, in which different options to the problem are formulated. In the third stage, decision making, a decision is made between the options suggested in phase two. This decision could also be that the status quo will be preserved, as already mentioned earlier in this paragraph. The policy implementation is stage four, in which the policies are put into effect. The last stage of the cycle is monitoring and evaluating the policy. The evaluation is very helpful for future problems, since the policy formulation is done on the basis of knowledge about certain policy measures. By evaluating the current measures, there will be advanced knowledge about these measures and they can be better adopted in the future (Howlett, 2019).

The way in which this cycle is used in policy design, and in which stage the policy goals and means occur, can differ from author to author. Hawkesworth (1992) is one of the main authors that see the policy process quite strictly. Every phase in the cycle has to be properly adjusted, before moving on to the next phase. In this view, policy goals and means are especially applied in the policy formulation phase. Howlett and Cashore (2009), on the other hand, see the cycle more as fluid and with overlapping phases. Policy goals and means are not solely implemented in the second phase, but occur throughout the whole process. In this view, policy making is seen as 'as a much more overtly social or political process in which actors compete with each other in order to attain their goals or collectively 'puzzle' through toward the solution to an issue' (Wu et al., 2010).

2.3.4 Knowledge as policy basis

For a clear and comprehensive definition about policy design, both the substantive and procedural side have to be included. For this research, the definition of Bobrow (2006) will be used. This definition is widely acknowledged as a comprehensive policy design formulation (Howlett, 2019). According to Bobrow (2006), policy design is:

"a specific form of policy formulation based on the gathering of knowledge about the effects of policy tool use on policy targets and the application of that knowledge to the development and implementation of policies aimed at the attainment of specifically desired public policy outcomes and ambitions." (Bobrow, 2006: in Howlett, 2019, p. 48).

In this definition, policy designs contain both a substantive component and a procedural component (Howlett, 2011). The policy tools and development and implementation of policies are mentioned, as well as the different stages of the policy cycle that has to be completed in order to design public policies. In this definition, the gathering of knowledge has a prominent position. Knowledge is the basis of policy design and has to be applied to create public policies. Mintrom (2007) acknowledges that knowledge plays an important role in policy design and states that evidence-based policy is needed for efficient and effective public policy making. Public policy should be designed through a theoretically informed process and empirical analysis. By doing that, governments can draw lessons from experience and avoid repeating errors, as well as better apply new techniques to both old and new problems (Sanderson 2002).

There is not just need for knowledge about the effects of certain policy instruments, but also about the mix of different instruments to a portfolio with policy goals and means. Effectively optimizing the policy instrument choice in such portfolio requires knowledge about instrument-goal interactions and about how these policy mixes change over the long run (Howlett, 2019). A multi-level governance component can be important in gathering and applying this knowledge (Del Río & Howlett, 2013). This knowledge influences the interactions between the policy goals and policy means of figure 5, as well as the interactions between the different policy levels. This leads to a nested model of policy instrument choice (Howlett, 2009). A portfolio or mix of instruments could be possible – and in most cases is desired – but these instruments have to be coherent, consistent and congruent (Schneider & Ingram, 1990).

2.4 Conceptual model

As mentioned in chapter 1, the research objective is to find what the user requirements of urban distribution hubs are, and how this can help local governments in creating urban distribution hub policies, together with their own ideas and visions towards urban distribution. The policy design theory will be the guideline to reach this objective and forms the basis of the conceptual model. In this research, the focus will especially be on substantive policy design, rather than procedural policy design. In other words, this research will focus on policy goals and means, and not on the policy process. Since urban distribution hubs are still a quite new phenomenon, knowledge about these hubs might not be apparent in all municipalities. The focus will therefore mainly be on the way municipalities see the possible effect of policy instruments on urban distribution in general and urban distribution hubs specifically. This research aim could therefore be describes as finding a way to combine the external factors and practical insights with the policy targets, objectives and aims of local governments, to create clear and realistic hub policies. The conceptual model can be seen in figure 8.

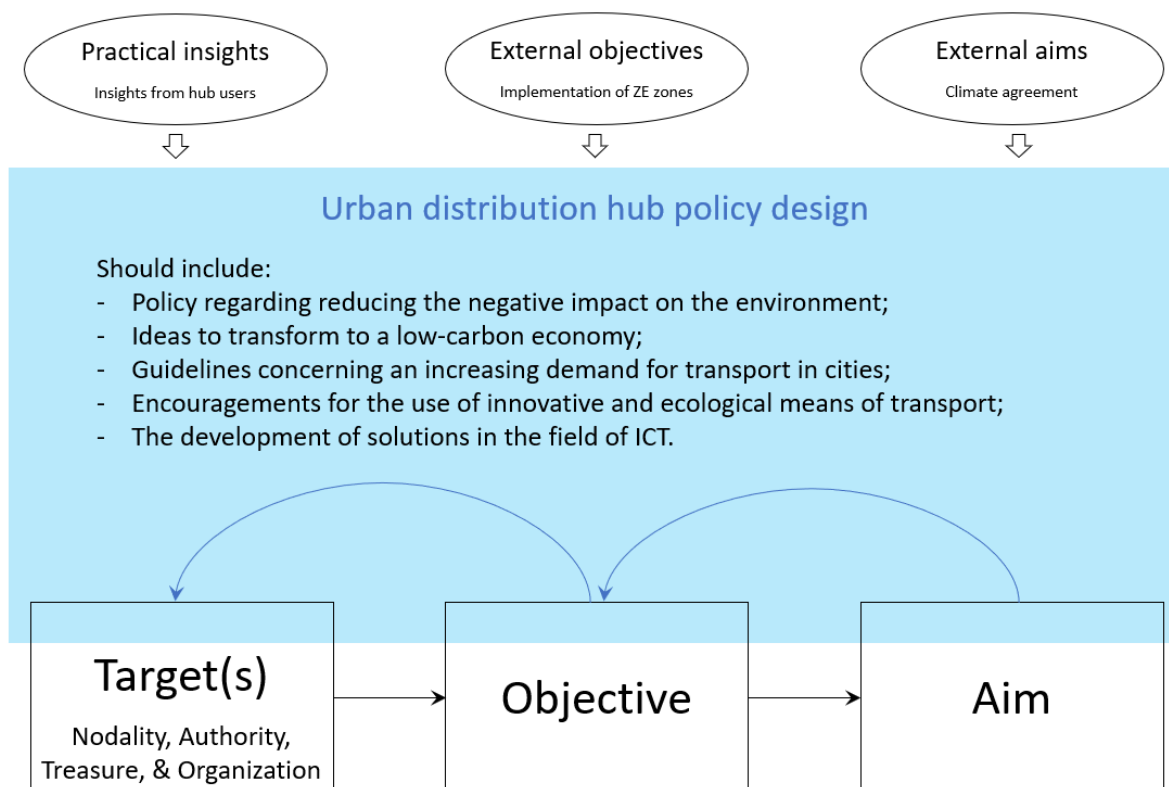


Figure 14 - Conceptual model (own work)

The three square boxes at the bottom represent the causality of the public policy that will be implemented. A policy target (or measure) influences a broader objective, which at their turn influences the main policy aim. These targets, objectives and aims consists of both policy goals and means, so they include answers to 'what' and 'how' questions.

The policy design structure, however, reasons the other way around. This structure is visualised in the blue square and with blue arrows. First, a main policy aim has to be made. This aim can be operationalized into an policy objective. To fulfil this objective, one or more targets have to be set. Every target can be one of the four types of governing instruments: nodality, authority, treasure, or organization. One target might be fitting for an objective, however having multiple targets will oftentimes contribute to an objective even more. In the policy about urban distribution hubs, the five aspects of transport policy as stated by Kiba-Janiak (2017) have to be present. This means that the policy should include: policy regarding reducing the negative impact on the environment; ideas to transform to a low-carbon economy; guidelines concerning an increasing demand for transport in cities; encouragements for the use of innovative and ecological means of transport; and the development of solutions in the field of ICT.

This whole policy design process is done on the basis of knowledge about urban distribution hubs. However, local governments do not only make decisions solely based on their own knowledge. Practical insights from hub organizations can provide helpful insights for local governments that are creating public policies. Besides that, some external objectives and aims can be apparent. In the case of urban distribution and urban distribution hubs, the national government signed the Climate Agreement (Klimaatakkoord), which has led to the encouragement of ZE zones. These decisions influence the possible policy design of local governments and have to be thought of.

3 Methodology

In this chapter, this research' methodology will be discussed. In the first paragraph will be an elaboration of the research strategy. The second paragraph will discuss the data collection and the sampling framework, after which the data analysis will be discussed in paragraph three. Lastly, the quality requirements are touched upon in paragraph four.

3.1 Research strategy

In this first paragraph, the research strategy will be discussed. According to Van Thiel (2014), the terms research strategy, methods and techniques are quite often confused with each other. In this research, the division between these terms that 't Hart et al. (1998) composed will be used. According to them, the research strategy is the overall design of the research. It is an overarching procedure that contains all methodological choices. A certain research strategy will make the use of certain research methods and techniques more logical than others. Research methods in this case refer to the way data is gathered or collected. Lastly, the research technique is the way in which the data will be analysed. This paragraph will focus on the research strategy (overall design), while the next paragraphs contain an elaboration about the research methods (data collection) and techniques (data analysis).

Van Thiel (2014) distinguishes four main types of research strategies: the experiment, the survey, the case study and desk research. While experiments and surveys need a wide field of units of study, a case study tends to focus on less fields of study. Surveys mainly deal with a large number of respondents, which makes statistical analysis possible. Experiments are mostly used to test hypothesis. In this research, there are not many fields of study: there are not that many municipalities that will implement a ZE zone. This makes surveys and experiments less suitable. A case study, on the other hand, seems more applicable, since they focus more on 'depth instead of breadth' (Timney Bailey, 1992). By using a case study, a researcher aims to get an integral insight into a few time-spatially limited objects or processes (Verschuren & Doorewaard, 2015). According to Yin (2003), in a case study 'a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control' (Yin, 2003, p. 9). This applies to this research, since the research question is a design question (starting with 'how') about a specific event, namely the implementation of urban distribution hub policies. Van Thiel (2014) also states that research questions that focus on design are especially fitting for a case study design. Besides that, the applied nature of case studies make it very suitable to contribute to a solution for a concrete social issue. The essence of a case study 'is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result' (Schramm, 1971, p.6).

An advantage of a case study design is the holistic approach towards a phenomenon. In a pure quantitative research or a survey, in-depth descriptions of a phenomenon will be lost and not investigated, while the holistic case study approach is very suitable for elaborate descriptions (Yin, 2003). A holistic approach means that a large body of data, which mostly is qualitative, is gathered on everything to do with the phenomenon (Van Thiel, 2014). A method that is often applied in case studies, is the interview. Paragraph 3.2 will go into more details about the interview as a research method. Although observations are often used as well, this method does not seem very applicable for this research. Since this research is about urban distribution hub policies, making observations do not contribute much to the gathering of meaningful information. A disadvantage of case studies is that the results cannot be generalized easily, since the gathered knowledge is case-specific (Yin, 2003). Because of this, the reliability and validity deserves extra attention (Van Thiel, 2014). These quality requirements will be discussed in paragraph 3.4.

3.2 Research method

The research method focusses on the way data is gathered or collected. As stated earlier, doing interviews fits well to the case study research strategy. Besides interviews, other research methods can be used to gather data to create triangulation (Van Thiel, 2014). Observations however are not very applicable. To still create some different perspectives and insights on the phenomenon of urban distribution hub policies, interviews with different kinds of groups are conducted. First of all members of municipalities were interviewed. Besides that, an interview with a province is conducted, to have input from an overarching point of view. Thirdly, interviews with urban distribution hub users or hub entrepreneurs provide practical insights from a user perspective.

3.2.1 Sampling framework

Deciding the number of respondents and the reasons for selecting these respondents are both part of the sampling framework (Van Thiel, 2014) and will be discussed in this sub-paragraph. Two kinds of sampling are indicated by Black (1999), namely probability and non-probability sampling. By probability sampling, the units of study are selected by chance (probability) instead, while the choice for respondents with a non-probability sampling relies on a theoretical basis (Van Thiel, 2014). Usually, a non-probability sampling method is used when there are not many units of study available (Miles & Huberman, 1994). Since there are only 26 municipalities that are introducing a ZE zone (*ZES partners, n.d.*), the units of study can be considered rather small in the case of this research. When a non-probability sampling method is applied, respondents are chosen on a theoretical basis. For this research, different sizes of municipalities from different regions are used as respondents.

Table 1 provides an overview of all 26 municipalities that are implementing a ZE zone. The municipalities that are interviewed are indicated with green rows. In this table, the municipalities are ranked from most populated to least populated (*Allecijfers.nl, 2021*). The column 'position' refers to the place on this ranking the municipality has in the Netherlands as a whole. The column 'position ZE' refers to the place on the ranking when only the municipalities that are implementing a ZE zone are counted. The table shows that municipalities from all sizes are chosen to be respondents.

There is made sure that every region of the Netherlands is included as well. The regional division that is used here, corresponds to the regional division that is used for the Administrative Consolutions ['Omgevingsagenda's]. The twelve provinces of the Netherlands are assigned to a total of five districts ['Landsdelen']¹. These regions make a regional approach for everything that has something to do with the use of (urban) space. The main subjects of these districts are mobility, energy, agriculture, economy, nature and housing (*Omgevingsagenda, n.d.*). Since urban distribution and urban distribution hubs fall within the theme of mobility and the use of space, this regional distinction is used in this research.

¹ District North consists of the provinces of Groningen, Friesland and Drenthe; District East contains Gelderland and Overijssel; District South is formed by Noord-Brabant and Limburg; District South-west are the provinces of Zeeland and Zuid-Holland; District North-west consists of Noord-Holland, Flevoland and Utrecht.

Municipality	Inhabitants	Position	Position ZE	Region
Amsterdam	872.922	1	1	north-west
Rotterdam	652.541	2	2	south-west
Den Haag	547.757	3	3	south-west
Utrecht	359.376	4	4	north-west
Eindhoven	235.707	5	5	south
Tilburg	234.795	6	6	south
Groningen	233.218	7	7	north
Nijmegen	177.321	10	8	east
Apeldoorn	164.770	11	9	east
Haarlem	162.549	12	10	north-west
Arnhem	162.477	13	11	east
Enschede	159.703	14	12	east
Amersfoort	157.438	16	13	north-west
Zaanstad	157.013	17	14	north-west
Den Bosch	155.496	18	15	south
Zwolle	129.827	19	16	east
Leiden	124.077	22	17	south-west
Maastricht	120.182	23	18	south
Dordrecht	119.111	24	19	south-west
Ede	118.538	25	20	east
Alphen a/d Rijn	112.580	26	21	south-west
Delft	103.588	30	22	south-west
Deventer	101.227	32	23	east
Gouda	73.678	50	24	south-west
Hoorn	73.602	51	25	north-west
Assen	68.833	53	26	north

Table 1 - Overview of municipalities implementing a ZE zone and interviewed municipalities (own work with data from Allecijfers.nl, 2021)

An ideal size of a non-probability sample is not provided by Van Thiel (2014), but she states that generally speaking, the larger the sample, the better. Although not all municipalities that are implementing a ZE zone are interviewed, a broad range of those municipalities are included in this research. With a diversity in both municipalities' population and the districts of the municipalities, a theoretical basis of chosen municipalities for this research is drawn up. In probability sampling, a sufficiently large sample can be seen as representative for the population as a whole (Black, 1999). There are different formulas to know how large the sample has to be, but the usual rule of thumb is that a sample should be at least 20% of the population (Van Thiel, 2014). Although this research has a non-probability sample, interviews are conducted with 35% of the total population (total amount of municipalities with a ZE zone). So, to a certain extent, this sample is able to provide some insights about all 26 municipalities.

Apart from the interviews with the municipalities, a member of the province of Overijssel is interviewed, who also is program manager for urban distribution hubs in District East. He is interviewed for his expertise on this subject and his overarching view on urban distribution. Since not only municipalities are engaging in hub policies, but districts as well, this interview is a valuable addition to this research.

Besides interviews with municipalities, eight interviews are conducted with urban distribution hub entrepreneurs too. Their input can be very helpful as practical insight for hub policy design. For this category, there is tried to include different kinds of urban hub users. Since urban distribution hubs (UDHs) can be divided into two main kinds – UCCs and dedicated hubs – both these kinds are interviewed. There is also tried to include companies operating in a variety of sectors. It is not possible to draw any general conclusions from these eight interviews, because these eight companies do not account for at least 20% of the total urban distribution hub companies. These interviews are especially used to gain practical insights from different perspectives, types of hubs and sectors for possible hub policies.

3.2.2 Interviews

Three types of interviews can be distinguished: unstructured or open interviews, semi-structured interviews and fully structured interviews (Gubrium & Holstein, 2001). Unstructured or open interviews are especially suitable for exploratory research, where the researcher only has one question prepared and mainly let the respondent interpret this question (Van Thiel, 2014). On the other side of the spectrum, fully structured interviews are in fact oral questionnaires or surveys, and are not very applicable to this research as well. Semi-structured interviews do have prepared questions, but also leave room for interpretation of the respondent. For semi-structured interviews, an interview guide is prepared with both open-ended and close-ended questions. During the interview, this allows the researcher to adjust to the response of the interviewee (Corbin & Morse, 2003). The questions in the interview guide reflect to the questions stated in the research problem and specify the kind of information the researcher wants to acquire (Van Thiel, 2014). These questions from the research problem are the main questions and the three sub-questions. Besides these questions, related questions are also included in the interview guide. The interview guide for the interviews with local governments, dedicated hub users and UCC users can be found in appendix B, C and D respectively.

A total of 19 interviews were conducted. Appendix A contains an overview of the interviews. Interviews 1-8 are the interviews held with companies, interviews 9-18 are the interviews with municipalities and interview 19 is the interview with a province. For the companies is indicated what their connection to urban distribution hubs is. Two different interviews were held with the municipality of Leiden, hence the double reference. The interviews with Enschede and Nijmegen were group interviews with multiple respondents, 5 and 2 respectively.

In chapter four, the findings of the interviews are included. To refer to a statement from these interviews, there are reference numbers included for every interview. As can be seen in appendix A, each respondent corresponds to a number. All interviews are recorded, transcribed and provided with line numbers. When, for example, (4,283) is mentioned after a quote or certain statement, this means that respondent 4 made this statement or quote in line 283. In this way, it is traceable which respondent made the statement and where in the transcript it can be found. Although all findings are traceable, the full transcripts are for privacy reasons not included in the appendix. If there is a need to see a transcript, these are available upon request. Please keep in mind that all the interviews were held in Dutch, but since this thesis is written in English, all quotes are a translation.

3.3 Research technique

The research technique consists of the method in which the gathered data is analysed (Van Thiel, 2014). After the data is collected, the first step of data analysis is ordering all the collected data (Flick, 2002). When all the data needs to be ordered properly, this data first have to be documented. In this research this means that literal transcripts of the interviews are made. The advice of Miles and Huberman (1994) to use a clear index and filing system is applied in this research. For both types of interviews – with hub users and local governments – information on all subjects and questions is brought together. After that, data reduction is the next step of the analysis (Van Thiel, 2014). The interview guide and the definitions are used to make a selection of all useful information for this research.

The main part of data analysis consists of coding. In this research, codes are made partly inductive and partly deductive. The deductive codes were decided on in advance of the data analysis (Flick, 2002). These codes were arranged in accordance to the theoretical framework and the interview guide. By doing this, there is made sure that all relevant information for the main research question and sub-questions will emerge from the data. Besides this deductive coding, a round of inductive coding is applied as well. In an inductive coding process, the codes are not decided upon beforehand, but are developed and refined during the process of analysis (Flick, 2002). This leaves room for findings that were not specifically expected to emerge, but are also useful for this research. Through axial coding, the found codes are ordered, so an overview of opinions on the same subject is created. In chapter four, the results are presented in line with this system of ordering. Every sub-paragraph covers a certain subject or aspect of urban distribution hub policy and include all useful points of view on these aspects.

3.3.1 Research paradigm

A thing to keep in mind when analysing the gathered data, is that all the provided information might contain certain values of the respondents. This research has an interpretative approach towards the gained knowledge and provided information, which means that all knowledge is an interpretation. As Van Thiel (2014) states it, *verstehen* is very important with this approach. All reality is subjective, which means that both the respondents and the researcher have certain values and reflect these on reality. This means that there are no real facts, but every statement is value-laden and ‘truth lies in the eyes of the observer’ (Moses & Knudsen, 2012). This interpretative approach corresponds to the idea of constructivism, where realities are mental constructs (Guba & Lincoln, 1994). For this approach or stance towards research, narrative approaches are suited best (Moses & Knudsen, 2012). This connects to this research, since a narrative approach – interviews – is used. By means of these interviews, a holistic view on urban distribution hub policies is provided. Qualitative inquiry is most suitable for a comprehensive, holistic and in-depth investigation of a such complex issues in its context. When conducting an in-depth analysis, the participants’ perspective can be understand better (Harrison et al., 2017). This enables the researcher to provide a less value-laden view on a subject, which ensures that a more objective view towards the subject can be made.

3.4 Quality requirements

This paragraph will provide an overview of all quality requirements that have to be thought about when executing any research. So, for this research as well, multiple quality requirements are taken into consideration. This paragraph consists of an overview of these consideration about the main quality requirements: reliability and validity (Van Thiel, 2014).

3.4.1 Reliability

Reliability consists of two components: accuracy and consistency (Van Thiel, 2014). The first element, accuracy, refers in particular to the measurement instruments that are used. In the case of this research the measurement instruments are semi-structured interviews. To make sure that the measurement instruments are sound, the instruments will be checked together with an expert on urban distribution hubs. Apart from the mentor from the university, there will be some guidance from the professional field, who is an expert on urban logistics and distribution. Another way to make the interview guide more sound, is to do an 'practice interview' (Yin, 2008). In this research, a practice interview is not really conducted, because this first interview is included in this research as well. However, after the first interview, the interview guide was updated a bit to its final form. Although this first interview is included in this research, a second interview with the same municipality is conducted to be sure that all possible information is gathered.

The second element of reliability is consistency, also known as repeatability. A method to create a higher reliability is to create a large enough sample. Currently there are 26 municipalities that will implement a ZE zone (*ZES partners*, n.d.). Ten of these municipalities are included in this research, which makes the sample is smaller than the total 'population'. To make sure that this research will provide a repeatable result, the samples will be chosen to make sure the samples represent all municipalities with a ZE zone as good as possible. So, if this research will be done again, it is more likely that the same results emerge. An elaborate explanation of the sampling framework can be found in sub-paragraph 3.2.1.

3.4.2 Validity

There are two main types of validity: internal and external validity. The measurement instrument has to be clearly defined and exclusive, which means that it cannot be used for measuring other constructs (Van Thiel, 2014). To make sure the internal validity is taken into account, definitions of both urban distribution hubs and policy design are made, which can be seen in chapter two (theoretical framework). To substantiate this definition, it is made up of multiple earlier researches. To make sure that the answers, views and visions of the respondents are reported as intended by the respondents, a literal transcript of the interviews will be made. By doing this, no information will be forgotten by the researcher and all answers and views can be analysed in a structured way.

The external validity describes the extent to which a study can be generalized. To make this research generalizable, it is made sure that the samples represent the total amount of study objects. For the interviews with municipalities, there is made use of a purposive non-probability sample: a selection is made on theoretical grounds (Van Thiel, 2014). The generalizability for the interviews with urban distribution hub users will be a little bit lower, since the total population of urban distribution hub users is much bigger than the sample. However, for these interviews a non-probability sample is used as well. Respondents are chosen from all different kinds of urban distribution hubs, to include various insights and points of view. Again, a more elaborate explanation of this sampling framework can be found in sub-paragraph 3.2.1.

4 Results

In this chapter, the results from the interviews will be discussed. The first paragraph consists of the findings from interviews with companies. After that, the interviews with local governments, especially municipalities, will be discussed. At the end of this chapter there is a paragraph on regional approach towards urban distribution policies. In this chapter, the interview with the province will be connected to findings from the municipalities' interviews. The reference system as discussed in paragraph 3.2.2 will be used in this chapter.

4.1 Companies

The findings of interviews with companies will be discussed in this paragraph. All findings are divided in sub-paragraphs. In the first two sub-paragraphs, the building and location requirements will be discussed. The third sub-paragraph builds on this, by providing an overview of ways to improve the use of the building and the plot. The last three sub-paragraphs will discuss the view of the companies on urban logistics policies. First the zero emission policies will be covered, after which the hub policies and the pressure on urban space will be discussed.

4.1.1 Building requirements

Some companies have very strict ideas about the size of their building and their plot, especially the business to consumer (B2C) companies. Some companies – such as Jumbo, DHL and Coolblue – are looking for cross dock hubs for their home delivery supply chain (7,25). These companies sometimes have a supply chain with their own stores too, but especially home delivery hubs are very asked for. The required building sizes are very uncommon on contemporary Dutch industrial sites. “We are looking for a building percentage of 30%, while in the Netherlands the buildings generally take up at least 60% of the industrial plots” (3,205). Buildings with these building requirements is “a piece of real estate that does not exist” (3,186).

Although the required building sizes are uncommon in the existing market, the requirements of the B2C-companies are roughly all the same. “Most of the parties thought they had a unique question, but actually all of them were asking the same” (7,26). The building requirements of B2C-companies are a building of roughly 1500 square meters, on a plot of 6000 meters in total (3,190; 7,28). The outdoor area is used as a parking space and for trucks to move towards the loading docks (3,202; 7,29). There have to be a few truck docks, and around 8 (3,284) up to 15 (7,74) docks for delivery vans. It is preferred that these docks are not on ground level, but a little bit deeper than the building, so it is possible to cross dock on ground level without needing elevators (3,199; 7,70).

Consolidation hubs

The most important requirement of the building of a consolidation hub, or urban consolidation centre (UCC), is the presence of one or more loading docks (4,38; 8,165). “It ensures that the tail lift does not need to go up and down all the time, which is all time-oriented” (4,40). “The outdoor area is used for our material – vans, trucks, you name it – parking space, a bicycle parking and maybe a container” (8,237). Besides the ins and outs of the building itself, UCC's recognize the advantages of having a joint property with another company or another business operation. Lessgo is located in the same building as a logistics company (4,42), while MSG and UTS Verkroost have another business operation apart from urban distribution (5,31; 8,16). Lessgo prefers to have a joint property: “I prefer starting lean and mean. Strengthen each other. And when it all works out well, we could always go bigger” (4,423).

For bicycle courier companies the building requirements are not very high (2,160). “We need electricity to charge our electric cargo bikes and our telephones. And a shower in the building is nice, so we can have a shower at the end of our work shift. Since we need just 100 square meters interior space, some of the bicycle courier locations have a joint property with for example city hubs (2,162).

Energy demand

The energy supply is also a factor that plays a role in distribution hubs. All hubs have electric vehicles – some more than others – which need to be charged. Some smaller companies have enough network capacity for their current business scope (3;162; 4,332). These are the companies that do not have a fast charger, or only need to charge their phones and cargo bikes: “We charge our vehicles overnight and when we need a fast charger, we use a public one during day time” (4,335). Others are expanding their electric fleet and need a larger power connection for that. “Currently we have an electric delivery van and some passenger cars. Because we have ordered four electric box trucks, we need a new electricity cable. The current power connection is not able to handle that” (5,302).

In most of the cases it is no big deal to upgrade the power connection (5,319). Although in some cases, the power demand is too big or the current electricity network is too far away. In these cases, companies might have to pay for the construction of a new electricity cable themselves (3,176). Due to the lack of clarity around ZE zones and the state of technology, businesses do not know how many transformation stations they need, and if the current network can handle them (3,165). A (part of the) solution might be to put solar panels on top of the hub. Unfortunately that is not always possible, because companies do not own the building themselves (8,171) or because the solar panels cannot suffice the total energy demand. “Because we are developing for companies that are doing a lot with electric transport, they will use all of the energy from our solar panels. Still there is not enough capacity everywhere, we are working on that. (...) It is a challenge at some places” (7,129).

Other building features

Another important feature is the accessibility of the building. It is very desirable that the building is accessible 24/7. Although the bigger companies did not point this out, the smaller companies recognized it is an important feature (2;182; 4,317; 5,223). “We put the key in a locker, so I can give the code to the driver and he is able to get in” (4,320).

There has to be some sort of cooling and freezing capacity, in the case of B2B-conditioned food transport (1,25). This is not necessary for B2C-conditioned food transport, since they only do cross docking. “Our products are two hours in the building, on average. So before you even know, it is already gone” (3,249). For UCC’s, the main business is to bundle products and deliver them as quickly as possible, too. Having stock in the building is an option, but only “as a related service” (5,243). Although it is a related service, there are some pallet racks in the building, so the products can be stacked up to 10 meters high (5,266; 8,216).

4.1.2 Location requirements

For a location, most companies prefer to be near the main roads close to the highway. “A location near the main roads is very important” (4,36). “You don’t want to be in the middle of the city, that just takes too long for trucks” (3,143). “You have to be accessible from different highways” (8,190). “A hub needs to be accessible from the highway real quickly. That’s priority number one” (5,222).

Although the optimal location for a building is a location close to the highway, it has to be quite close to the city centre too. Locations near a ring road around the city are very popular (7,154). “The newer industrial areas are quite far away from the city centre, on the outskirts of the city. “From

there you have to ride 10 or 15 kilometres to the city centre, which is already quite something for a cargo bike, or for the range of an electric vehicle” (7,153). The downside is that the locations closer to the city often are brownfields, which are minimally available (7,308). And in the end, the availability of buildings or plots determines where the companies will be located. “It is not that always that academic” (3,142).

Existing logistics pattern

The location of a hub could also be dependent of the already existing logistics pattern. When Jumbo wants to open a hub in Eindhoven, for example, they look at the existing hubs in other surrounding cities. Since they already have a hub in ‘s-Hertogenbosch, they do not want to open a new hub on the north side of Eindhoven, which is near ‘s-Hertogenbosch (3,127). Cycloon also has preferences that depend on their existing logistics pattern. They have one main DC – located in Nieuwegein, near Utrecht. So when they start a new hub, they prefer to be on the side of a city that is closest to Nieuwegein (2,197).

Water bound locations

A water bound location is often not preferred by most companies. Some recognize the possible benefits, but acknowledge that transport by water also has its disadvantages. “The biggest disadvantage is that transport by water is very slow. And you have transshipment work, because you go from water to road transport back and forth” (4,365). When transport by water is mentioned, it is seen as an extra option, that might be beneficial in the future. “I think it still needs a few years to develop properly” (4,367). For construction logistics, water bound locations seem to be more popular. “It could be an interesting link to do transport over water, especially when you are dealing with major construction projects” (7,473).

Logistics flows

There are some big differences between different logistics flows. For instance, there is a lot of research focusing on parcels and unconditioned transport. For conditioned transport, the location spatial requirements are still in a pilot phase, because there is not much known about that (1,20). Different types of logistics flows have different effects on its environment, too. Especially the B2C-companies cause a lot of transport movements. A home delivery hub normally works with two or three shifts per day. Every shift around 40 delivery vans are driving back and forth to the hub, which means 80-120 transport movement per day for the vans only (3,195; 6,66; 7,202). On top of that, each location has its deliveries per truck. These are a little bit higher at B2C-hubs, with 10-15 trucks per day (3,195) than at UCC’s (4,261). The bicycle courier company roughly processes 10 trucks per day, but they do most of their delivery at (cargo) bikes, which has a smaller impact on its direct environment (2,306).

You should think twice before combining different sort of flows, e.g. food and parcels. Food and parcels could be an option to combine, but combining food logistics with waste logistics, is less desirable. Food has to meet certain quality requirements, so combining food with waste brings extra challenges (1,49). This does not mean that combining different flows is impossible or undesirable. When hazardous substances are processed in an UCC, for example, you have to rethink your layout of the warehouse. “You have to look at the way you can make divisions in your warehouse and if it is possible to make different compartments” (8,179).

4.1.3 Use of space

There are a lot of opportunities to make better use of the urban space. For instance, make use of circular products and build your hall in such a way, that it can be easily degraded. “There are a lot of things that we did not think of today, but are needed tomorrow” (7,498). When your buildings are flexible, you are able to adjust your building or plot to the needs of tomorrow. Other ways to make efficient use of space will be discussed in this sub-paragraph.

Sustainability

When asking about sustainability in buildings, all companies say that they are doing all kind of things to make their building and their business sustainable. Jumbo, PostNL, and ReLAB, all have BREEAM certificates for all their new hubs (3,398; 6,144; 7,292). For companies that rent their building, it is a little harder to be sustainable, since they are to some extent dependent of the owner. Both Cycloon and UTS Verkroost indicate that they reached out to the owners of their buildings and asked for solar panels, “but most of the owners are not very willing to help us with that” (2,283). “If this building was all ours, we would completely fill it with solar panels” (8,250). They still do as much as is within their means though, by having LED-lighting and ask drivers to turn off their engine while unloading, for example (5,324).

Even though all companies are very willing to make their buildings sustainable, their environment is sometimes not ready for that. Sometimes it is their own property owner, sometimes it is with other institutions. Energy from solar panels, for instance, cannot always be transmitted to the energy network (3,403; 6,155). Besides that, hub companies mostly use energy during night time to charge their vehicles, while the energy from solar panels is generated during day time. “I see a mismatch between the energy that we generate and the energy that we use. (...) It is not 100% logical” (6,152).

The outdoor area of hubs is mostly used as a parking lot. There are some ideas to make better use of the outdoor space. An option is, for example, to have a wood-metal construction on the parking lot, with solar panels on top. It provides a dry parking spot and makes it possible to charge your car at the same time (5,332). Parking on the roof is also a possibility, but it is very expensive (3,448). “What we are currently looking at – when the land price or the parking pressure is too high – is multi-level parking. Then we make a parking deck above our loading docks” (7,239).

Clustering

“In logistics, the most efficient way often is the most sustainable way, too” (6,203). Clustering is seen as an option that fits this phrase very well. Working together with other companies can be beneficial, companies can take advantage of each other (4,69). “If you want to work profitably, you have to cluster. (...) You need to have different hubs on the edge of the city, cluster there, and drive to the city effectively and efficiently” (5,148). PostNL, for example, even has a shared building with an e-commerce company. “That is super logical, because they can pick parcels until late at night, and via a conveyor belt the parcels are directly transported to us. (...) This is a far-reaching integration of processes, which is interesting” (6,196).

ReLAB also points at the benefits of clustering. “When you can have multiple parties under one roof, you use the available space more efficiently” (7,53). Besides that, when you want to develop a stand-alone hub, it is very hard to find an investor who want to develop for a reasonable return (7,43). The size of a stand-alone hub is too small for an project developer, and the market value of a hub is still unproven (3,254). By clustering a few companies at the same plot, it makes it more interesting for developers to invest in hubs (7,57). Also, it is possible to shift between the outdoor areas of companies: some companies need more parking space than others, so they can rent more parking

spaces on the plot (7,85). When there is some space left, for instance when the plot has a bulge at one side, it could be used for extra parking spaces or as a place to stall construction materials – a small construction hub (7,481).

Stacked buildings

There are possibilities for building another floor on top of the hub. Jumbo only needs a building height of 4 meters, so there are opportunities for building on top of the hub. “It is possible, but it should be low density companies. (...) We use a lot of outdoor space, but there are some companies that do not need that. (...) So you should put the service companies on top, and the big ones downstairs” (3,432). “It is possible, but it really has an impact. You need another type of building, which is more expensive, because the construction has to be a lot stronger. And the rental prices, who is going to pay for that? Besides that, it causes extra parking struggles” (7,598).

Although it is clear that there are some opportunities, there are no buildings realized like this yet. “I spoke with a lot of parties, with project developers. But if nobody wants to hire the upper floor or they do not want to develop it like that... Then that’s it” (3,430). When the demand is not high enough and the land prices are low, it is too expensive to build multiple floors or a parking deck. It is cheaper to buy extra land than to make a multi-layer distribution building, in most cities in the Netherlands (7,652).

Other efficient uses

Maybe it is possible to make use of cooling and freezing boxes. Although it is still in the pilot phase, it could be a smart way to manage space. “When these boxes could keep the products cool for 48 hours, maybe you don’t need fixed cooling and freezing space anymore. (...) Suddenly you have cool and freeze capacity that you can expand, or can reduce when you need less capacity” (1,63).

Another efficient use of space is a flexible hub. It is possible to use the hub in the morning in one place, and in the afternoon in another (1,32). “A flexible hub could be a mobile shipping container with facilities within it, or the trailer of a truck” (1,39). When implementing a ‘normal’ hub, there is need for infrastructure, which is not needed when using a flexible hub (1,34).

4.1.4 Zero emission policies

Companies acknowledge that municipalities are aware of the changes that need to be done to reduce polluting gasses. “Municipalities realize that something has to be done” (7,378). However, companies are quite sceptical about the ideas behind the ZE zone. Firstly, the impact of the ZE zones in general is questioned: “In my opinion that ZE zone really is nothing in most of the cities. The areas are very small, and it only affects cars that will be bought after 2025” (6,128). Secondly, companies recognize multiple problems in cities, when it comes to urban distribution. Two of them are identified by most of the companies, sometimes a third is added. The ZE zone ought to be a solution for both a reduction in pollution (cleaner) and traffic movements in the city (safer). Sometimes lighter is added to that list as a third component (3,158). “Switching to electric vehicles, that is one of the points of improvement. But there is consolidation – bundling – too” (8,123).

All these two (or three) components cannot be solved by implementing a ZE zone alone. Some companies believe that a ZE zone will only contribute to less emission, but will not reduce the amount of traffic. “By implementing a ZE zone, chances are that all companies are buying electric vehicles and will drive to the city centre electrically. That does not fix the problem. You only save some emissions, but there still will be a lot of traffic in the city centre” (5,136). “A ZE zone is effective

when it comes to driving electrically. But if you want to achieve bundling, you really have to force them to use a hub” (8,137).

“The whole zero emission is very contradictory. (...) It has to be cleaner, lighter and safer, which are contradicting assumptions” (3,158). A cleaner electric vehicle is at least heavier than its diesel counterpart, because of its battery. If it has to be lighter, the electric car thus has to be smaller. To be able to deliver all the products, it means there has to be more cars in the city. More cars is less safety, and more energy consumption and tire wear (3,159).

Focus on electric vehicles

There is much focus on electric vehicles when it comes to zero emission. “Electric freight transport is not only the future” (1,51). Hydrogen could also play an important role, as well as cargo bikes. Cargo bikes are often overlooked in the process (2,108). “Studies show that 70% of urban freight logistics can be distributed by cargo bikes, in large and middle-large cities” (2,23). According to bicycle courier company Cycloon, there are multiple benefits of using bicycle couriers: “At a lot of moments during the day, we are quicker than cars in the city. So we are very useful for rush jobs. Besides that, most of the bicycle couriers are highly educated, so you can provide some extra services for the customer. And of course we have a green image” (2,96). On top of that, bikes do not have to deal with the restrictions of time windows (4,85).

Although cargo bikes might be the most environmental friendly solution, there are drawbacks to cargo bikes. Because cargo bikes are quite small, their loading weight is limited too. “We use cargo bikes for small deliveries, up to 200 kilograms, which is half a roll container” (1,101). “At the moment there is no way to implement freezers on cargo bikes” which also is a limitation (1,104).

There are limitations on electric vehicles as well, for example the weight of the vehicles. “The battery pack of the vehicle is already very heavy” (1,53). In combination with the sometimes not fully sufficient range of electric vehicles, it could be that more cars have to be used. In some cases, that can mean that your company does not get the permit for the extra car, which makes driving electric disadvantageous (6,115). Even though the carbon dioxide emission of an electric car is zero – hence the zero emission – that car still has to be built and the electricity to keep the car running also has to be generated. It takes six years for an electric car to have less CO₂-impact in total, in comparison to an Euro-5 or Euro-6 vehicle (2,111; 3,162).

Showing decisiveness

Some companies indicate that it is possible to take steps in zero emission, if municipalities are decisive. Municipalities are the ones that can enforce change. “As long as municipalities are not making decisions, everything stays the same” (5,418). For example, the requirements should be higher in public tenders. “As long as some companies keep saying to municipalities that it is not possible, municipalities will not do it. Even though everyone knows that it is possible. (...) The more need a municipality has, the more impact they will make. There are solutions, but the status quo remains” (2,366).

The uncertainty surrounding ZE zones can make it very hard to know what to expect and to plan ahead. Currently it is not known whether electric trucks will be available when the ZE zones come into effect. “We are facing a huge operation in the Netherlands, and we do not see the solution” (3,149). Currently there are some pilots running, but 2025 is not that far away. There are decisions that need to be made: “So, or real progress has to be made now, or 2025 should not be a strict deadline” (3,422). Other companies do not see the availability of electric trucks really as an issue:

“Although I think, if the technology is not as far as it should be by that time, there will be made exceptions” (6,132). Companies do not have many time to wait for decisions to be made. “There are a lot of plans in the Netherlands, but nothing is actually realized” (3,264). All kind of plans are nice, but the companies have to choose at some point.

4.1.5 Hub policies

A hub could be an environmental friendly solution when it comes to bundling. By bundling the products of different suppliers, their goods will be delivered sustainably and with less vehicle movements in the city centre. At least, this reduction in transport movements is only possible if the current vehicles are not fully loaded (LTL: less than (truck)load). If vehicles have a full truck load (FTL), there will be no reduction in transport movements. So when considering for which sectors it could be useful to use hubs, you should look at the sectors in which there is LTL (5,155). “You don’t deliver full truck loads via a hub, full truck loads are going directly” (8,55). “The sectors with TLT are construction logistics, catering, and maybe service logistics. But service logistics is customization, so you cannot put a generic label on that” (3,358). Also retail non-food has a chance for bundling (3,363; 5,155). For construction logistics, it is especially the smaller deliveries that have chance to be bundled (2,360; 8,60).

Supporting companies

By implementing a ZE zone, municipalities are in a way forcing companies to think about their logistics, and how to make it more sustainable. “Municipalities can ‘close’ the city centre and say ‘polluting vehicles are banned’, but if you do not provide any alternative, then it stops...” (7,157). That is one of the reasons why some municipalities are reaching out to companies to help them find a location for their business, or providing them with a start-up subsidy. “They want us to deliver on bikes in their city, so they help us find a location” (2,228). Another reason for municipalities to support hub companies, especially B2C-companies, is the employment that they bring. Unlike large (inter)national logistics companies, most of the work force has a local origin. “A lot of drivers are needed, delivery van drivers. Most of them are young people, students, from the area” (7,191). Companies like Jumbo or Coolblue provide approximately 50-100 working spaces, “which is a lot at a distribution centre of just 1200 square meters” (3,324).

The help of municipalities could be very helpful. “We have got a subsidy in the beginning, (...) which covers the unprofitable start” (4,180). For smaller businesses, this could be very helpful when they would like to start a hub in a new city. “It is not about large amounts of money, but it helps us to get going in a city. (...) It is just the boost that we need” (2,265). “I am convinced that a hub can be profitable within two years” (4,190). Not every company agrees with municipalities providing money or resources to hub companies. “Municipalities have to enable, but they should not provide money to logistic processes. Come on, then it won’t exist anymore in about three years” (3,332). Still, municipalities should work together with logistics companies, for instance when it comes to permits or with finding a location. “When municipalities are implementing a ZE zone, they should come up with alternatives. Municipalities do not have to realize hubs themselves, but they should facilitate them somehow” (7,547).

Different approaches

Most of the time municipalities are willing to think along with the companies, although it might take quite some time. “A lot of pulling, very much talking. A lot of communication. It wasn’t that easy. (...) It just takes very long” (8,307). Sometimes, differences can be experienced between the way the different municipalities they interact with hub businesses. Some notice that smaller municipalities

are more helpful and more willing to think along. “Especially the bigger municipalities, they think it’s a lot of hassle. Although I think they have the biggest challenge, when it comes to last mile and zero emission” (7,370).

Companies also distinguish different approaches between municipalities. “Some municipalities keep doing research, organize support sessions. Then I think: ‘We should really do something at some point, instead of doing research’” (4,442). Start-up subsidies might be fitting for this, but really doing something is even more welcome: “Show initiative for the use of a hub. Report publicly that the municipality is using a hub, via social media, the newspaper, reports. (...) It triggers other companies to use a hub as well, because they see that the municipality sets a good example (8,335). Becoming a customer is one step, but spreading that message is even more impact: “Become our customer as a municipality, advertise us, stimulate other entrepreneurs, organizations, and schools to join us. That is much more important” (4,454).

Urban consolidation centres

For UCC’s, it is not easy to find customers for their businesses (4,100; 5,57; 8,22). It takes a long time for companies to make the decision to join a hub, both for local shop owners and national parties (4,132). Because of the Corona crisis, shop owners are holding back even more (8,24). “Their shops had to be closed, cafes and restaurants had to close as well, and their turnover has fallen sharply. They have other things on their mind than changing their logistics. Everyone has arranged their logistics in some way: whether it is good or not, they have arranged it” (4,114). As long as the shop owners and other companies in the city do not have a problem with their logistics, they do not feel the urge to change their logistics flows. “If they [shop owners] want to have their parcel delivered, it will be collected or delivered at any preferred moment. All couriers and transport companies can drive through the city centre almost unlimited” (5,60).

Not only shop owners, but also logistics companies are quite reserved. They are not very willing to hand over their logistics flows to another company. For some companies, their driver is not only bringing products from A to B, but he also is providing some extra services. For example, this could be someone who is installing the new washing machine at a customer’s house (7,616). “The drivers really are our corporate image” (1,150).

In general, UCC’s do not get many customers because of sustainability reasons. “For nine out of ten businesses, sustainability is an afterthought” (4,204). Most of them are doing it for operational reasons, for instance because their receiver obliges them to use a hub (8,117), or so they are able to join a tender (4,145).

Responsibility

The introduction of ZE zones might bring chances for the UCC’s. “Shop owners are forced to choose. They can either use a hub, or purchase electric vehicles themselves” (4,242). By including the use of a hub in tenders, municipalities can force logistics companies to use a hub. In that way, municipalities can affect both pollution and the amount of transport movements (8,146). It gives logistics companies no other choice than to use a hub, which ensures that all the products are going to the city bundled and electrically. Not only facility streams could be included in tenders, but for instance construction logistics could be, too. “When municipalities talk about urban distribution, they often talk about facility logistics. (...) Studies show that it is not the facility logistics that cause the main issues in the city, though.” (2,37). Construction logistics causes the most transport movements, so municipalities can have a large impact when they include zero emission and bundling in construction tenders (2,327).

According to catering supplier Bidfood, municipalities should take responsibility in bringing parties together. “Municipalities are struggling with the question ‘who is taking that role?’, which often brings them to the wholesalers or delivering parties, and less to the retailer. (...) To what extend are retailers being involved with the city centre problem, because the retailer eventually is the one who is located in the city centre and brings demand from outside the city centre” (1,251).

4.1.6 Pressure on urban space

Some of the companies, like Cycloon and Jumbo, are expanding their number of locations. It is quite hard to find a good building or plot to establish their business. “There is a lot of competition for buildings. Or in other words, there is just not much available” (2,215). “We are currently talking with possible tenants for our buildings and everyone says ‘finally, we were looking for this so long’. That does indicate that there is such a high demand” (7,97). “The demand is gigantic” (7,574).

When looking for a new place to build a hub, it is cheaper to build on a greenfield location than to restructure a brownfield. Buying a building on a brownfield, demolishing it and building something new is a possibility, but it is very expensive. “The demolition costs are not that high, but the owner wants some extra money for the building as well. But that building is worth nothing to us” (3,232). When there is an option to build on a greenfield and to restructure a brownfield, the costs are very decisive. “So we are talking about renovating industrial areas. But who is going to pay for it? We prefer a greenfield location over a brownfield location, with half the cost extra” (3,227). Only when there is no greenfield available, for instance in the urban areas in the Randstad, brownfields will be an option (3,238).

According to the interviewed companies, municipalities seem to be quite willing to provide space for an hub. “Municipalities all struggle with their zero emission policy. It makes them more willing to say ‘okay, we had plans for something other than this, but if you can realize your hub here, it helps us to realize our zero emission goals” (7,168). Municipalities are very eager to work together with businesses, but sometimes they do not have the resources. “Because not every municipality has plots available...” (7,174).

4.2 Municipalities

The findings of interviews with local government parties will be discussed in this paragraph. This paragraph consists explicitly of findings on the scale level of municipalities. Some findings from the interview with the province are included, but these reflect on the scale level of municipalities too. Findings on regional or provincial approach can be found in paragraph 4.3.

All findings are divided in sub-paragraphs. In the first sub-paragraph, the main reasoning of the nine municipalities will be discussed shortly, after which an overview table is provided. In the following sub-paragraphs, there will deeper insights in the different urban distribution themes.

4.2.1 Overview of municipalities

The nine interviewed municipalities have different views on logistics and hub policies and have a different availability of possible space for hubs. In this sub-paragraph, the positions of all municipalities will come across alphabetically. At the end of this overview, the main results on hub policies and spatial availability for hubs are displayed in table 2.

Amsterdam is the biggest city in the Netherlands, with one of the highest population densities. The planned zone for the ZE zone is a rather extensive area, especially in comparison to other ZE zones. Their zero emission area is quite ambitious, but the municipality does not really have a stance in hub policies yet. Amsterdam has the ambition to facilitate hubs, but does know to what extent. To determine their future point of view, the municipality is doing pilot studies with different sectors. These pilot studies are meant to provide some insights in the requirements for hubs and the possibilities for bundling. Although Amsterdam is considered rather densely build, they see some possibilities for creating space for hubs by revitalizing business parks.

Den Haag is also a big city in the western part of the Netherlands, but above all has the highest population density of all Dutch municipalities. In other municipalities, Den Haag is known for their collective tender of their facility logistics. Although this seems to indicate that they have made policies on urban distribution, Den Haag is still in the start-up phase. This collective tender is more or less a single project, in combination with ministries and companies. Den Haag really wants to create a policy frame for urban distribution and hubs, so it has a policy basis on which it can take actual measures. These policies, alongside with the ZE zone, can enforce companies to change their contemporary logistics.

Enschede is a medium-sized city in the eastern part of the Netherlands. When it comes to logistics and hub policies, they are still very searching. Their ambition is to come up with hub policies though, so it gives them a chance to steer in giving out locations and know to what extent they will facilitate hubs. The ZE zone for them is a framework, in which companies are free to move. If companies can arrange their logistics according to the zero emission guidelines, that is fine. If they cannot, the municipality feels responsible for providing hubs or facilitating them in some way. At the moment they do not have a clear view on whether to facilitate hubs or not, but the municipality is helpful to companies that are looking for a place to start their hub.

Gouda is a medium-sized city in the Randstad region. Almost all of the municipalities' ground is already filled, so there are just a very few greenfields. Gouda is in the start-up phase of their urban distribution policies, as the zero emission zoning plans are just accepted by the council. The effects of the zone implementation on the municipalities' companies are still unknown by the municipality itself. They are currently inventorying the needs of the companies concerning the ZE zone. Gouda feels responsible for providing a means for entrepreneurs to get their goods in their shops. Because

there are very few greenfields available, the restructuring of business parks seems to be the only solution.

Groningen is a city in the north of the Netherlands, with low-density municipalities in their surrounding area. This means that there is more space available in the neighbouring municipalities, as well as on the outskirts of the city itself. This sets Groningen apart from municipalities in the Randstad area and eastern and southern parts of the Netherlands as well. Groningen is quite ambitious when it comes to logistics policies. For example, in 2022 they are already implementing time windows with advantages for zero emission vehicles. The municipality is doing quite some things to help companies facilitate hubs, including helping them financially, if needed. Their view on future hubs is not completely clear yet, but they already have some ideas where they will work with. The rise of micro hubs for instance is one thing that Groningen will make policies for, to see where these hubs could be located. Space in the outskirts of the city may be available, but space in the city centre and neighbourhoods in the city are quite scarce in Groningen too.

Leiden is located in the Randstad area and is medium-sized when it comes to number of inhabitants. The area of the municipality, however, is not very big, which makes Leiden a very dense city with a high degree of pressure on urban space. The lack of urban space in a way defines the hub strategies in the city. There is no space available for dedicated hub users: they can find their place elsewhere in the surrounding municipalities. For multi-hub users, their task is to be creative. The municipality facilitates this creativity by connecting different companies and show the best practices of companies that already found each other.

Maastricht is located in the south-eastern part of the Netherlands. For the implementation of their zero emission plans, Maastricht gets help from Zuid-Limburg Bereikbaar (ZLB), which is asked to give substance to the implementation plan. ZLB is especially focusing on providing information and help to all kinds of entrepreneurs and businesses that are involved with the ZE zone. For logistics companies, they provide help in finding out whether their fleet could be electrified (Electric Vehicle (EV)-scan) and informing them about subsidies and the stand of the technique. For hub companies, they help finding locations for their hub and find possible companies that they can work together with. All in all, Maastricht feel the responsibility to make all companies in the area zero emission ready by 2025.

Nijmegen is a city in the east part of the Netherlands. In Nijmegen, the zero emission policy is considered not only a measure for reducing pollution, but also for reducing vehicle movement. This vehicle movement reduction will be achieved by the increasing use of a hub. The introduction of the zone will play a part in this, but the municipality will support hubs as well by creating mass. Different measures are taken to create this mass, although there is not a clear comprehensive policy that includes all these measures. Nijmegen has a little bit of control over the location of the hubs as well, because there are a few plots available.

Tilburg is a city in the south of the Netherlands and is the sixth largest city in terms of inhabitants. Space in the municipality is very scarce, business parks and industrial areas are almost completely full. This contributes to the reserved view that Tilburg has on providing hubs. Tilburg has the opinion that the urban distribution in the city should be arranged by the entrepreneurs themselves. The city only provides preconditional infrastructure and communication with and between companies. Enabling conversations between different companies is very important in Tilburg, because finding creative connections is practically the only way it is possible to set up a hub.

Municipality:	Hub policies:	Availability of space for hubs:
Amsterdam	Has ambition to facilitate hubs, but has to do research before knowing to what extent they will facilitate.	Space is very scarce, but by revitalizing business parks, space for logistics and hubs can be zoned in.
Den Haag	Does not have a clear image of urban distribution and no policy yet. Wants to have hub policies, so there is a policy basis on which companies can be enforced to use hubs.	Almost no greenfields available. Those that are available can only be filled in by logistics companies if they are very creative in the use of space. Otherwise brownfield development is the only option.
Enschede	Does not have hub policies yet, but has some thoughts on it. Wants to create hub policies, so it becomes possible to steer in the degree of facilitating hubs.	Very few greenfields are available, but those are quite far from the city centre. Brownfields are a more realistic option.
Gouda	Does not have any, but feels the responsibility to facilitate hubs to some extent for their city centre entrepreneurs.	Very few space available. There are vacant buildings, but that are office buildings most of the time. Brownfield development and changing the function is the only option.
Groningen	One of the municipalities that is a little bit further in having hub policies. Although they state that they are still quite searching, they have already some advanced thoughts on hub policies.	The available space in Groningen is located on the outskirts of the city, on business parks with plots especially for logistics. Locations closer to the city centre are much more scarce, though.
Leiden	Has some thoughts about facilitating hubs, which are quite reserved. Leiden is especially facilitating by finding combinations between companies and promote the best practices.	When it comes to plots, second to none are available. Consolidation hubs can find their space in the city by being creative, collaborating with others and finding ways to 'create' space for themselves.
Maastricht	Is helping local entrepreneurs to be ready for the zero emission implementation in 2025. On the one hand they are providing help by giving information about electrifying entrepreneurs' fleet, on the other hand they help hubs to find locations and make connections to businesses.	Maastricht in a compact city, but there is still some space available for logistics parties and hubs. Still, possible hub locations close to the city centre are very scarce in Maastricht as well. Both consolidation hub companies as dedicated hub users are being supported to find locations.
Nijmegen	Is open for all kinds of hub initiatives, but does not have a clear vision or hub policy. Although there is in a way no clear idea for hubs, the municipality is doing all kinds of things to facilitate hubs.	There are some plots available, but these are especially on the outskirts of the city. The demand for space is a lot higher than the amount of free locations, but there is a little bit room to steer towards certain directions.
Tilburg	Has a clear vision on hubs: it is up to the local entrepreneurs to provide hubs and arrange urban distribution. Tilburg facilitates this process only by providing information and connecting companies.	No greenfields are available, except for some very small plots. Companies have to be creative and move in with other companies or have to go for brownfield redevelopment.

Table 2 - The main results on hub policies and spatial availability for hubs in the nine analysed municipalities (own work)

4.2.2 Urban logistics policies

When it comes to urban logistics, municipalities have a lot of ideas how to steer the effects. However, the general overview of the ideas is sometimes lacking, as well as an urban distribution policy. Den Haag, for instance, states ““We, as a city, do not have a clear image of urban distribution and certainly do not have policies for it” (10,34). To gain insight on the current stance of the stakeholders, municipalities have a lot of contact with companies. All municipalities have their own way of communication with logistics companies and city centre entrepreneurs. They are organizing stakeholder sessions, setting up pilots with them, inventorying what they need and stimulate initiatives of companies (9,59; 10,226; 11,222; 12,90; 13,109; 14,48; 16,141; 17,148; 18,146).

Measures

Municipalities have different goals with the urban logistics measures they are taking. Most of the measures contribute to the reduction of the number of vehicles on the one hand, or discouraging polluting vehicles and stimulating clean ones on the other. Both measures are mostly done to fulfil sustainability and climate adaptivity goals (10,28), which improves the life quality in the city (15,235).

A distinction is made between measures that lead to less vehicles and measures that lead to cleaner vehicles. Measures that are taken are for example the implementation of time windows (10,280) or access policies (11,303). Those two can also be put together: having broader time windows for electric vehicles (13,15). Other measurements that are thought about are the implementation of privileges (e.g. allowing electric vehicles on bus lanes; 17,256) and reducing the number of lanes and the speed limit (18,138).

Leiden states that there is a lot to gain if the urban distribution process would be smarter. Linking a distribution company to a company with a large electricity connection (e.g. a laundry company) or data-driven inventory management could be smart solutions, for example. According to Leiden, this all connects to the so called ‘trias mobilica’, which indicates three steps in improving transport. Changing and cleaning are two of them, but reducing is the most important. Reducing connects well with smart solutions: data-driven inventory management leads to a reduction of vehicle trips, as well as bundling (14,109).

ZE zone

The implementation of a ZE zone is a measure that is taken to have effects on urban logistics too. The implementation of the zone often connects well to the cities’ sustainability goals (13,27; 18,56). Den Haag describes the implementation as follows: “By implementing a ZE zone, you can force companies to meet the zero emission requirements for their supply of goods and waste disposal. So in a certain way, the companies are forced to take measures, which makes the whole chain move (10,269). Enschede also sees the ZE zone as a framework in which market companies are free to move within: “We set the rules for a ZE zone and we let the market deal with it” (11,200).

The desired effects of the ZE zone mainly focusses on the reduction of pollution and improvement of air quality (18,127). “It makes the city centre more attractive: quieter, cleaner, and more space. If you do all three correctly” (14,239). Even in municipalities that see other impacts of the zone as well, the emission reduction is the most important effect. Nijmegen, for instance, states that their first goal is to reduce emission. Secondly, they want to achieve reduced vehicle movements and less nuisance (17,130).

Challenges

Municipalities see that there are some possible challenges that they have to tackle, that are not always completely within their own reach. First of all, the question is whether small businesses have enough resources to invest in an electric vehicles (18,157). Municipalities might have an influence on this challenge. For example, some municipalities want to tackle this challenge by facilitating hubs to a certain extent and giving the entrepreneurs the chance to choose if they want to invest in electric vehicles or use a hub (12,91; 16,205; 17,268).

Secondly, the capacity of the electricity network could be a challenge too. Although the responsibility for the electricity network is not up to municipalities, this could be causing problems in the future (9,232). Especially on certain times on certain locations, the peaks in energy demand will be too high (11,569). For instance, this high demand could occur on business park locations in the early evening (19,218). For some municipalities this is a blind spot, because they are not the ones that are in charge of the energy network (11,545). In Leiden, the municipality is already facing a challenge regarding the electricity network. Transformer stations need to be build, but there is no urban space available (14,95).

Another challenge might be the availability of electric trucks. According to municipalities, logistics companies are a little sceptical towards the ZE zone, especially when it comes to larger distances and big trucks. Their concerns mainly are focused on the availability of electric trucks in 2025 and/or 2030 (17,93). Some logistics companies collectively send a pressing letter to the ministry (11,282). Others are lobbying the municipality itself to gain extra time (9,157). What they especially want is clarity about the zone implementation, so they know what to invest in (17,241; 19,160). Municipalities acknowledge that the zero emission policy is a national affair and are not very willing to change the rules themselves (17,98; 18,110). "In the execution agenda is included that municipalities are free to have local policies. That will be our last resort. We strive to have as much uniformity as possible" (11,292).

Combining ZE zone with other measures

According to most municipalities, the ZE zone is not going to be the solution for both reducing and cleaning the vehicles in the city. "The accessibility problem won't be fixed with the introduction of the ZE zone" (16,293). Together with other measures, it would be possible to reduce the number of vehicles. With time windows, for example, you cannot force companies directly, but it is possible to set some conditions. "And with measures like that, I hope that they [the companies] will combine and bundle eventually" (10,281). Groningen acknowledges that. The implementation of the ZE zone, together with time windows and exemption policies for logistics traffic, will help the city to reduce both emission and the amount of vehicles (13,51).

Both Groningen and Tilburg specifically chose their ZE zones to be the same as earlier implemented zones. In Groningen the ZE zone matches their time window area, while in Tilburg it is the same as their environmental zone. This is done out of pragmatic reasons and to create clearness (18,124). "We can steer integrally inside that area. Not only on zero emission, but also to reduce traffic" (13,81).

Although the implementation of the ZE zone might be challenging when it comes to big trucks, for smaller vans the implementation seems to be not as challenging. This especially is due to the availability of electric vans. "It's a pity that the national government decided that there are transitional arrangements for vans too, because the availability of electric vans is growing rapidly" (17,90). Some municipalities decided to respond to this by expanding their access policy for zero emission vehicles for specific target groups, for which zero emission is already achievable. Especially

the smaller vans are eligible for this. “For instance, if you want to do a backorder in food retail, you are allowed to, but it already has to be a zero emission delivery” (11,315). Groningen is introducing a similar measure in 2022. Their new time windows ensure that the amount of vehicles reduces till little to none in the afternoon. “That causes logistics companies to change their way of delivering in the morning. We see that there is a lot of room for efficiency improvement, which is up to the sector to change that” (13,55). Nijmegen did already have a pilot with wider time windows for electric vehicles, but that was not a great success. “We implemented extra time windows in the evening hours, but not many businesses made use of it. Extra time windows in the afternoon are not desired, because it is already very busy on the streets” (17,112). Tilburg decided to stick to the original implementation plan and is implementing the ZE zone in 2025 for both vans and trucks. “We decided to implement it all together to ensure unambiguity. So we do not treat vans and trucks differently” (18,106).

Zero emission in tenders

Many municipalities see tenders as a way to steer towards zero emission. Some municipalities are already including zero emission in their tenders, but most of them are not really sure yet. Maastricht is thinking about including zero emission in tenders to fulfil their sustainability goals too, but has some doubts. They do not want to rule out companies that cannot already meet the zero emission requirements (16,246). Sometimes, not everyone at the municipality is convinced that it has to be included in the tenders already (14,45). “It remains a discussion, whether it is pushing up prices and if we want this already. Basically it would be good if we were a little more progressive than our own rules, just to get everything rolling” (11,270). Most of the municipalities think that they should provide the good example and take up the front-runner role (17,242). “Giving the good example, that will be needed at some point” (12,178). “We are currently rethinking our own logistics flows. ‘Practice what you preach’ and giving the good example, that is one of the measures that we are currently working on” (15,274).

The use of a hub could be a part of a tender too. Where the ZE zone can contribute to make urban logistics cleaner, the use of a hub can be the reason for less vehicle movements. “The accessibility problem won’t be fixed with the introduction of the ZE zone. The use of a hub can contribute to it, though.” (16,293). To achieve that, hubs should be included in a tender (17,300). However, a lot of companies do not prescribe the use of a hub, but include conditions about bundling in their tenders (13,184; 17,294). In that way, companies will have their own freedom in taking care of their logistics.

4.2.3 Hub policies

Many municipalities do not have clear policies regarding hubs. Most of them are still in the exploration phase, or not even there. Out of the nine interviewed municipalities, only three have quite a clear vision on hubs. Two of them – Leiden and Tilburg – have the vision that they do not want to facilitate hubs, what makes it easier to create a vision (14,44; 18,182). Out of the other seven municipalities, only Groningen seems to have quite a clear view on the way they want to handle hubs. The remaining municipalities sometimes do have measures and are facilitating in some way, but without an overarching policy (16,205; 17,60). These municipalities are still very searching and are in the exploration phase (12,113). “We do not really have [hub] policies. We have some ideas and mindsets, but those are very limited” (11,133). “We did not direct towards something, as a city. Which is still the same” (10,74).

Although not many municipalities have a clear vision on hubs yet, they all want to have or are working on some kind of policy. Especially for consolidation hubs, municipalities want to create policies. Hubs are still quite new, which is a reason that hub policies are still in its infancy. Another

reason is that there are multiple disciplines involved: economics, urban space, ground positions, and charging infrastructure are all themes that touch upon hubs. “The hub phenomenon is going a lot further than logistics alone” (9,81). It ensures that at least urban planning, economy, traffic, and sustainability are involved in the process of creating hub policies (9,97; 11,74; 17,32; 19,22).

Current stance of hubs

The current stance of consolidation hubs depends a little bit of the municipality. In Gouda, there are currently no hubs of that kind (12,141). In seven municipalities, there are hubs that have settled without any help of the municipality (9,225; 10,75; 11,334; 13,145; 15,75; 17,25; 18,274). This means that only in Maastricht, the municipality helped facilitating all (3) of their current consolidation hubs. Most of the time, the help mainly consists of being a communication partner and giving advice. This varies from finding locations to advising about electrification of the fleet (16,167)

In Den Haag, Enschede, and Groningen some hubs were able to start with the help of the municipality as well, but in these municipalities there are some hubs that came up without any help as well. The hubs in Groningen got some help based on the current policy (13,146). In both Den Haag and Enschede, one hub received help from these municipalities. Den Haag made a tender for their own facility logistics flows, for which they joined a project team with different ministries and companies. All these parties collectively bundled their logistics flows into one tender. This tender landed in a single hub. “In this case, I think the critical success factor was the creating mass” (10,185). In Enschede, the municipality facilitated the search for a location (11,340). In both Den Haag and Enschede, this facilitation did not originate from hub policy.

Facilitating hubs

As stated, municipalities are still very searching for the way they want to provide hubs. An indication of every municipality’s stance towards facilitating hubs will be given in this section. After that, a summarizing table is included to provide an overview of the possible measures per municipality.

Amsterdam is still finding out what stance they take in facilitating hubs, although they have the ambition to facilitate them somehow in the future (9,167). Though, they are not able to determine yet whether they will facilitate hubs themselves, finance them or enforce them (9,95). “We have to figure out what the requirements for hubs are before we can determine our position in facilitating hubs. You got to know what is possible to do and have a joint image of hubs – with the departments of economics, urban space, ground positions, charging infrastructure, all together – before knowing what position you take” (9,93).

Den Haag is still very searching, but does want to make hub policies. There are too many questions at the moment. Too much is unknown. ‘What is needed?’, ‘What will the implementation of zero emission bring?’, ‘How much space should be provide for urban distribution?’, ‘To what extent does the municipality has to be involved in this?’ (10,100). “We should make hub policies and link things together” (10,208).

Enschede is wondering which steps they should take in facilitating hubs. “If we have policy goals, we should aim to achieve them. Now we have wait and see attitude: can we achieve our policy goals on zero emission and the reduction of transport movements with that? Or should we do more?” (11,149). “We feel the urge already, because in about four years the delivery vans and trucks have to be out of the city centre” (12,151).

Gouda really feels responsible for its local entrepreneurs, now they have confronted them with the future implementation of the ZE zone. “We are going to inventory the entrepreneurs: what do you

need and how can we help you with that?" A hub could be the answer, but that is just one of the possibilities. "It is one of the biggest and most accessible options" (12,91). Gouda is still very searching on how to realize urban distribution. Another question that arises is "Does it [a hub, for instance] really have to be in Gouda or not?" (12,122).

Like most municipalities, **Groningen** takes on the role of a networker and brings parties together. When doing that, they will not only talk to parties, but if necessary come in action too. "We can make certain arrangements that makes it more interesting to exploit a hub, if the hub reduces the amount of traffic in the city centre. (13,172). On top of that, Groningen is already reserving some space for logistics on business parks, even though those locations are on the outskirts of the city (13,231). Finally, Groningen is willing to contribute financially and includes zero emission and bundling in tenders for their own logistics flows (13,145).

Leiden is one of the lesser facilitating municipalities. Partly this is because the municipality has no plots for hubs themselves, so they cannot facilitate there, but mainly this is because of their stance. What Leiden mainly does, is bringing companies together. Facilitating by creating chances, seeing possible linkages and inspire other companies to follow (14,47). Financial support is not ruled out, but is not likely to be given to certain companies. It is more likely to go to smart solutions, for example for smart charging, but that is still unsure (14,292).

The municipality of **Maastricht** has outsourced the facilitation of hubs to Zuid-Limburg Bereikbaar (ZLB). This program office is mostly providing communication with logistics companies. ZLB provides "kind of an all-inclusive solution to companies, for when they are confronted with zero emission urban distribution in 2025" (16,205). It facilitates roughly two solutions. The first is a solution for logistics companies that are willing and able to electrify their fleet. For these companies they stimulate their transition towards the use of electric vehicles (16,107) and are active in providing charging infrastructure (16,139). The second solution is for companies that cannot or do not want to electrify their existing fleet. For those companies, ZLB is working together closely with hub operators. They get entrepreneurs in touch with each other and provide help in the search for hub locations (16,180).

For **Nijmegen**, the key in the success of an hub is creating mass. They expect that the implementation of the ZE zone in 2025 will contribute to this in the first place (17,137). On top of that, the municipality wants to help facilitating hubs themselves. They will mainly do this by communicating with parties and connecting them, but they will also help search for locations and even financially contribute to the start-up of hubs as well (17,279). Besides that, they are open to reserving space for hubs and including hubs in tenders too (17,226). Although Nijmegen has all these ideas, there is not an overarching hub policy and no clear vision on how to create mass. "All these parties are saying 'create mass, create mass', but how do we do that?" (17,139).

Tilburg is very clear when it comes to their role in facilitating hubs. "Do we see a role for us as municipality in facilitating hubs? No, we don't" (18,182). Tilburg has three reasons for that. "Firstly, we think it is the role of the market. Secondly, we stimulate indirectly. Thirdly, if we want to stimulate actively we need space, but we don't have that" (18,223). The indirect stimulation is done by different things. "We stimulate all parties to have conversations with each other, for instance to exploit opportunities in return logistics" (18,193). Besides that, Tilburg is investing in preconditional infrastructure and research. For instance, they co-finance and subsidize distribution by water, technological solutions and digitalization (18,230).

Overview of facilitating hubs

There are quite some differences between the municipalities. There are two things municipalities are unanimous about: bringing parties together and setting up hubs. None of the municipalities is (planning to) set up hubs themselves, whereas every municipality sees a role for itself to bring parties together. Some even see the role of facilitator as the core role of the municipality: “Maybe the municipalities’ role is to bring parties together and make them work together. Be a sort of facilitator in that process” (12,162). “Sometimes a little bit of advice or stimulation is just what a company needs to take the step” (16,322). “We are exploring the possibilities with them to see what is already possible, and most of the time they recognize that it is not so hard after all” (17,166). “That is not only a task for municipalities. The province has some logistics agents that can play a part in that as well. In bringing stakeholders together” (11,254).

Table 3 provides an overview of the ways municipalities facilitate hubs. This consists of both the current policies as their future policy plans. The municipalities are ranked from least to most wanting to facilitate. The facilitation score (in the column ‘score’) is the sum of all the ways municipalities are wanting to facilitate. Yes counts as 1, maybe as 0.5 and no as 0.

Municipality:	Score	Setting up hubs	Reserving locations	Looking for locations	Financial support	Creating starting volume	Bringing parties together
Tilburg	1	No	No	No	No	No	Yes
Leiden	1.5	No	No	No	No	Maybe	Yes
Amsterdam	2.5	No	Maybe	No	Maybe	Maybe	Yes
Den Haag	3	No	Maybe	No	Maybe	Yes	Yes
Gouda	3	No	No	Yes	Maybe	Maybe	Yes
Maastricht	3	No	Maybe	Yes	No	Maybe	Yes
Enschede	3.5	No	Maybe	Yes	No	Yes*	Yes
Groningen	4	No	Yes	No	Yes	Yes*	Yes
Nijmegen	4	No	Maybe	Yes	Yes	Maybe	Yes

Table 3 - Current and future stance of municipalities on facilitating hubs (own work)

*including in tender: it has to be delivered zero emission, not via a hub per se

4.2.4 Vision on hubs

All municipalities have some visions or ideas about hubs, although these visions differ from municipality to municipality. Not all hub aspect is very clear and determined to every municipality. However, the preferred location is quite clear to most municipalities. Both the connection to a highway and the proximity of the city centre are mentioned as preferred locations (12,101; 15,215; 16,230). “The preferred locations are close to the highway exit and relatively close to the city centre” (11,121). The desired location also differs between different hubs: from the outskirts of the city to as close as possible to the inhabitants of the city (17,40). An important feature for a hub location could also be the proximity of a huge electricity user, which already has a major connection to the energy network. This could be the terrain of an old factory with initiatives for a hydrogen hub, or combining it with a huge laundry company for example (14,100; 17,394).

For future locations, municipalities see that hub companies are looking for smaller plots, closer to the city centre (13,243). “The desired location is very close to the city centre, so companies have smaller distances to the consumer and the retailer” (16,230). On the other hand, some municipalities are asking themselves whether the hubs should be located in their municipality (12,122). “Maybe in five years, it is possible with an electric truck to be in the reach a smaller nearby city. Then it is possible to settle your business in that other city too, so you do not have to be located in the big city itself”

(10,126). Companies sometimes are already settling in neighbouring municipalities. “Their first requirement is to be close to the highway, which is possible there as well. On top of that, there are no plots or buildings available in the city and when they are available, they are very expensive” (15,214).

Distinction between hubs

Municipalities acknowledge that hubs are not a fitting solution for all kinds of logistics flows. Full truck loads are not suitable to be delivered via hubs (9,170). Parcel and supermarket companies that deliver at home do have full truck loads (10,293; 11,212; 17,314). They will keep their own logistics process and buy electric vehicles to replace the conventional vehicles (17,227).

Non-food retail and facility logistics more often do not have full truck loads (16,269). This is partly because these sectors do have another business case. “Their trucks drive through multiple provinces to supply their shops. For this sector, it could be a lot more meaningful to stop at the border of a city and deliver their goods at a hub” (11,214). In facility logistics is a lot of room for progress, for example by including zero emission conditions in tenders, or oblige the use of a hub. For construction logistics, this is already done more frequently. “The bar for construction logistics is already a lot higher. When a company does not want to meet the requirements, it knows that it will be soon out of work” (16,281). Den Haag and Enschede add to this that you got to have policies first, before obliging parties to make use of a hub (11,149). “As long as we do not have policy and rules, we cannot enforce them [companies] to use hubs” (10,229).

Den Haag and Groningen state that it is possible to reduce the nuisance caused by construction projects. Both efficiency and the reduction of transport movements in construction logistics can play a role in that (10,220). There is especially a lot to gain by bundling. Zero emission is not really possible for major construction logistics yet, but bundling could make a better business case, which brings the purchase of an electric vehicle more within reach. Eventually this could make it possible to include the use of zero emission vehicles in a tender (13,346). A study in Leiden showed that a construction logistics hub would be promising and interesting in Leiden, but the municipality decided to leave the facilitation of it to the market (15,67).

Hub possibilities

When it comes to finding a hub location in most municipalities, chances are very low. There are multiple ways to increase your chances, as a hub company. To put it shortly, companies need to reduce their use of space. “You really have to be creative and search together with other companies, or have multiple use of space” (10,114). “There has to be investments in double use of plots, otherwise there is no possibility to settle here” (18,325). Making a parking deck instead of using all of the outdoor space could be a good starting point, but sometimes that is not enough. “Hub companies need a lot of outdoor terrain. Making a parking deck will not save them enough space” (10,429).

A way to have multiple use of space, is to combine functions on one plot. Some functions that are mentioned are adding a sport school (11,440), P&R (Park & Ride) parking space (16,467; 18,397), or climate adaptation measures like solar panels (18,397). Offices could be possible too, but the demand for offices is not that high at the moment. Office spaces supporting the company beneath are a better possibility in that case (10,448; 11,442). Other options could be the implementation of sports fields or a park on the roof of logistics buildings, but “we are not that far yet to take it really seriously” (18,403). Besides the space savings, combining functions could also lead to a better business case (11,535; 13,348).

Although “it is possible to combine business functions, it is absolutely not easy and definitely not cheap” (10,440). Combinations of similar functions can also interfere with each other. The combination of a bus depot and a hub, for example, can lead to a high demand of electricity. Sometimes it could be better to combine things that seem to have nothing to do with each other, like a park or a sports field. “Then they won’t interfere anyway” (15,378). Still, it could be possible that both functions are in each other’s way. Adding a non-logistics business on top, like a sport school or an office, also increases the traffic movements around the building. “How do you deal with the extra parking pressure that will arise when you have another business on top of a hub?” (11,533). “Hubs have a lot of outdoor space. People will have to cross that if they want to get to the businesses on top” (12,266).

Combining with existing company

Instead of looking for a new space to combine different companies or functions, maybe it is more useful to focus on existing logistics businesses. “Maybe it is a possibility to search for a link with an existing logistics company that has some space left. That you turn the question around” (11,461). In Leiden this approach is already put into use. A sanitary dealer, for example, has replaced its warehouse space out of the city. The freed up space is now used by a multi-user hub company (14,23). “And we think that this could be done in the same way with other companies in the city” (14,76).

Nijmegen sees existing logistics companies as a chance for new hubs. “In Nijmegen are quite some logistics firms that have a really interesting location and have room left to fulfil a hub function” (17,349). Groningen connects to this by wondering if the best way to have a multi-user hub is to start one from scratch. “I see that parties who are already in logistics, that have their own logistics flows, have more success in starting up hubs. (...) So, hubs as a core business, I think there are not enough logistics flows yet” (13,203).

Combining with multi-modal hub

When it comes to different kind of hubs in the city, Leiden distinguishes three types: a distribution centre, and P&R location and a neighbourhood mobility centre. In these neighbourhood mobility centres, pick-up point for parcels could be included as well (15,410). But combining distribution centres – or urban distribution hubs in this case – and neighbourhood hubs is not likely to happen. “Those two have different location requirements (15,57).

Den Haag, Amsterdam and Groningen are more optimistic about combining different hubs (9,22; 13,291). “It would be nice if multi-modal hubs could be cross-linked to urban distribution” (10,142). The availability of land makes it quite hard to develop these hubs. Groningen is already planning to make the next steps: “We are already in the phase that we agreed to do something with it. We see all these changes [in use of space] and we want to respond to it, although we do not have concrete ideas yet” (13,297).

Groningen even goes a little bit further by stating that the future neighbourhoods should be built differently and more adaptive to the future needs. “Nowadays everyone in the Netherlands has a letter box. Maybe we don’t need those so much in the future, but we do need to have a hub in the area where you can pick up your parcels” (13,313).

4.2.5 Pressure on urban space

All municipalities acknowledge that there is pressure on urban space to some extent. In most municipalities, there is no room for hubs (9,182; 10,145; 12,305; 14,14; 18,208). These municipalities

are the municipalities in the Randstad area – Amsterdam, Den Haag, Gouda and Leiden – and Tilburg. In the municipalities outside the Randstad area, little bits of space are available. Groningen, for example, has already reserved space for logistics functions. These locations are located on the outskirts of the city and not close to the city centre (13,203). Enschede, Maastricht and Nijmegen have kind of the same issue. “The city centre areas are scarce” (16,420). There is a little bit of space, but it is located on business parks on the outskirts of the city (11,96). “And even there, the demand is much higher than the available space” (17,448).

Reserving space

Amsterdam sees some opportunities in revitalizing business parks. “Industrial areas and business parks have to be revitalized every few years. For some of them a combination with residential functions might be a possibility, for others a logistics function might be fitting” (9,182). This option might not be the available option in every municipality, for every kind of hub. “The locations that will be available in 5 to 7 years, are too far away from the city centre, so they will not be an option for bicycle couriers, for example” (10,152).

Most of the municipalities do not know whether they want to reserve space for hubs or not. “Municipalities do not always recognize the importance and contribution that hubs can bring” (16,459). Groningen is the only municipality that wants to reserve space to some extent. They already saving some space for logistics companies on business parks and are considering to reserve space for construction logistics hubs and micro hubs as well (13,288; 13,339). Leiden and Tilburg also have a clear opinion: they do not reserve space. “We initially thought about reserving space or designate areas to urban distribution, but we saw that our current business areas can deal with it” (15,95). “There is no space. We are not going to facilitate the demand for space for new companies” (18,317). The remaining six municipalities are not sure yet if they want to reserve space. However, Gouda tends not to reserve space, because they do not have any plots (12,42).

Managing space usage

It can be quite challenging for municipalities to manage the use of space. “We cannot control it ourselves, as a municipality, if we do not have ground positions” (12,42). There seems to be a connection between the availability of land and the need to facilitate hubs. Leiden and Tilburg indicating that they have no space available and are less likely to facilitate hubs (14,14; 18,208). Amsterdam, Den Haag and Gouda also state that their plot availability is second to none (9,177; 10,329; 12,46).

Also in the other municipalities, considerations are made to manage the use of space. “When deciding to sell some plots, the money we gain is of lesser importance. The contribution to economic goals is important, for instance the contribution to employment or to zero emission” (11,136). Den Haag and Leiden have some opinions about dedicated hub users, especially with their current space usage (10,116). “We are not facilitating dedicated hubs. To a certain extent, we would like to support companies that fulfil a role in helping our city centre entrepreneurs, but those dedicated hubs can search for their location somewhere else in the region” (15,294).

Development ideas

Some municipalities are steering towards brownfield developments. “As long as municipalities have plots themselves, they can steer in brownfield versus greenfield developments” (11,408). In Amsterdam, Den Haag, Leiden and Tilburg, there are no other options than brownfield development. Even there the possibilities are already becoming scarce. “We do already have a lot of brownfield

developments, because there are no plots available anymore. The low-hanging fruit is already picked” (18,211). Even though brownfield developments are widely supported, it is not easy to steer towards it. The low land prices are a huge reason for that (11,379). “It is ridiculous that land prices are so low! All kinds of boxes [distribution warehouses] exist because of it, there should be a smarter way” (14,31). Another reason is that the existing buildings – even though they might be obsolete – are too worthy. “Office buildings for example are worth more than grounds with a business purpose” (12,237).

Another development idea is to cluster hubs together. “Putting them together on one hub or location could bring logistical or organizational benefits” (15,107). Besides that, negative externalities are clustered as well. For example, the nuisance that the vehicle movements provide, are centred in one location. For hub users it could be beneficial too. “If you want to boost these companies and give them a chance, then it would be great if you can cluster a few hub parties. It stimulates partnerships and if a company does not make it, it is easy for new companies to join the cluster. Besides, you can regulate and steer logistics flows much better” (10,88).

4.3 Regional approach to urban distribution

In this sub-paragraph, the regional approach on urban distribution will be discussed, especially the view of provinces on urban distribution. Since only one interview is conducted with a province, these insights are more intended as ideas how provinces can support municipalities and companies regarding urban distribution. The conducted interview is held with the province of Overijssel. Together with the province of Gelderland it forms ‘District East’ [Landsdeel Oost]. District East has collectively initiated to come up with a regional approach for urban distribution, as stated in the Appointment list Administrative Consultations MIRT [Afsprakenlijst Bestuurlijke Overleggen MIRT (BO MIRT)]. In the Netherlands, the province of Limburg and District North are the only other umbrella regions that have a collective approach towards urban distribution within the framework of BO MIRT (Rijksoverheid.nl, 2020). This quite unique approach is also acknowledged by the province of Overijssel (19,388).

This sub-paragraph will firstly discuss the way the province of Overijssel (with District East) is implementing their regional approach. This will contain their vision on facilitating hubs, as well as the way they collaborate with municipalities and companies. Secondly, the possible advantages that a regional approach could have will come across. The final sub-paragraph will be about the current regional approaches of municipalities and their contacts with umbrella bodies.

4.3.1 Implementation of regional approach

The provincial or district approach towards urban distribution mainly focusses on providing support and having an integral approach. This integral approach is needed to prevent that the smaller municipalities get all the problems that are pushed out by the bigger municipalities – the waterbed effect. “It can’t be that when bigger municipalities implement ZE zones with time windows and such, all those polluting conventional vehicles are being used in the smaller municipalities” (19,46). This integral approach is set up together with the province of Gelderland, with which District East is formed. This district approach is not very different than the approach of municipalities, when it comes to facilitating hubs. “We are not going to set up a hub ourselves, that is up to the market. However, we are supporting municipalities and companies and helping them in their imaging and ideation about hubs” (19,235).

The province of Overijssel is providing support to three groups: businesses, municipalities that are implementing a ZE zone, and municipalities that are not implementing a ZE zone (19,68). For the first two groups, the province developed a toolbox to help municipalities and companies to make urban

distribution more sustainable. This toolbox consists among others of financial support (e.g. subsidy schemes) and the help of logistics agents. For smaller municipalities, that are not planning to implement a ZE zone, the province provides a roadmap towards sustainable urban distribution. With this roadmap, smaller municipalities can join the chances that are coming up in other – bigger – municipalities (19,70). In District East, more than 15 municipalities without a zone are willing to join this movement (19,77).

Apart from providing support, District East is also doing research on regional hub development. “Some urban distribution hubs are already realized here and there, but it is quite challenging to realize a conclusive business case. We are now – very practically – looking at ways in which a regional hub can contribute to a better business case, so that it will be profitable” (19,91).

4.3.2 Possible advantages of integral approach

The provincial of Overijssel distinguishes some advantages when having an integral approach on urban distribution. First of all, it is practical. “Doing things together, makes it possible to work efficiently. It brings a lot of benefits” (19,400). Secondly, as a district you have a lot of expertise on urban distribution. They do not only have access to the practical insights logistics agents, but they also have input from all municipalities. This makes it possible for the district to create an overarching image. “It is sharing knowledge, developing a strategy together, that brings us a lot” (19,402). In third place, doing research on regional developments is more easily done. For the research on regional hubs, for example, the insights of different regions within District East can be put together to create a more complete insight (19,87). Fourthly, the province has resources to encourage both municipalities and companies to take steps in sustainable urban distribution. For companies, among others subsidies, an EV-scan and logistics agents are available. For municipalities, support is given towards infrastructural measures. As a province, you can match the interests of municipalities with companies with these measures (19,180). This also has something to do with the final point: creating clear guidelines. The province or district can set up guidelines and roadmaps that are the same for all municipalities within their region. As a result, there will be a coherent policy in all municipalities. This is very beneficial for companies too, because they have to deal with the same measures in different municipalities (19,336).

4.3.3 Integral approach of municipalities

An integral approach thus can have its advantages. Although not all municipalities are currently working together with a province or district, most of them do have a regional management on urban distribution. This mostly consists of a region with their municipality as the major city and its surrounding municipalities (9,257; 10,305; 12,16; 14,61; 17,53; 18,70). Some issues that are discussed are possible locations for companies (10,305; 18,70) and the cross-border logistics flows (9,257). In some municipalities, sharing knowledge also comes up as an important feature or their collaboration (16,64; 17,53).

Some municipalities see that a provincial approach towards urban distribution can have its advantages (11,254; 17,54), or that the lack of an approach can stand in the way of municipal interests (14,80). Leiden, for instance, wants to focus on the possibilities on urban distribution by water. The province however is planning to lower some bridges in the city, which makes it harder – or sometimes impossible – to have distribution by water. “There should be more consistency between municipal and provincial interests” (14,267). A provincial or district approach could contribute to this.

5 Analysis

In this chapter, the three sub-questions will be answered. This will be done by connecting the findings from chapter 4 with to the theories of chapter 2. The first three paragraphs contain the insights from the three sub-questions, respectively. Paragraph four combines these insights to fill the conceptual model and create an overview of the impact of the different targets, objectives and aims. The main question will be answered in the next chapter (chapter 6).

5.1 Urban distribution hub requirements

The first sub-question to be answered is *‘What are the usage requirements for urban distribution hubs?’*. This sub-question links to the ‘practical insights’-part of the conceptual model. The requirements of urban distribution hub users could reveal what incentives could work for them and makes the implementation of hubs more realistic. To answer this question, a distinction is made between dedicated hubs and consolidation hubs (UCCs). These different kinds of hubs have different needs for both space – building and location – and facilitation.

Dedicated hubs

Dedicated hub users are most commonly used by B2C-companies. They have very detailed spatial requirements. They are roughly looking for plots with a building of 1500 square meters and an outdoor area that is almost three times as big as the building (5000 – 6000 square meters). These locations are very rare on existing business parks, which often makes B2C hub users prefer greenfield locations. It is possible to redevelop an existing site, but this often is more expensive than building on a greenfield. When it comes to the location, sites close to the highway exit or main roads are preferred. As a second preference, a location close to the city (centre) is mentioned. These locations are especially preferred by bicycle courier companies. This is because bicycle couriers have a disadvantage when travelling in the outskirts of the city, where not much citizens live. These requirements are oftentimes recognized by the municipalities. Municipalities know what kind of space dedicated hub users are looking for and in some cases municipalities try to support that.

In the literature, the location preferences are also recognized. A lot of studies are executed to determine the most optimal locations for hubs. Locations between highways / main roads and the city centre are also emerging from these studies. The building and plot requirements are not present in the literature.

Urban consolidation centres

For UCC’s, hub requirements consists of two things: a location and enough turnover. When one of them is missing, an UCC will not be able to last. For their physical location, building characteristics are of lesser importance than for dedicated hubs, but the location matters for them as well. Again, highway locations are the first priority, with a location somewhat closer to the city centre as a second preference. Even more important than the location itself are the possible connections that UCCs can make with existing companies. Especially logistics companies are preferred. Combinations with existing companies ensure that UCCs can benefit from the other logistics company – and vice versa sometimes as well. This collaboration between existing companies and UCCs is not very present in the literature. Like dedicated hubs, much of the location requirements focus on most optimal locations. However, this is of lesser importance for UCCs.

The second requirement for UCCs is enough turnover. During the start-up phase it is quite hard to have a conclusive business case. Moving in with another company can help with that, or having another business next to their urban distribution process. Besides that, funding from local

governments can give them a boost to successfully overcome their start-up phase. This funding is meant to cover up for the start-up costs. It could also be a contribution to the purchase of materials, for instance. In about two years, an UCC could be profitable and sustain itself. The implementation of the ZE zone will probably also help UCCs to be more self-sustainable, although not all municipalities and companies are convinced of that.

During the start-up phase, it is not always necessary that municipalities contribute financially to support the UCC. There are other ways that local governments can help, without explicitly providing money. Achieving enough turnover – the second requirement – can also be a way to support UCCs. This can be done by using hubs for the municipalities' own logistics flows, or by marketing and communication. Through marketing and communication, other companies could be encouraged to use a hub, with provides higher turnovers. The support during the start-up phase is also mentioned in the literature. Both initial funding and assistance from municipalities are mentioned as valuable for UCCs. Municipalities that use hubs for their own logistics are not that much acknowledged in the literature.

Other requirements

Other requirements that seem to have some kind of importance in the literature, are the availability of the energy network and a water bound location. Urban distribution hubs users often use electric vehicles, which have to be charged at the hub. When there is a lot of electricity needed at one time, the energy network is sometimes not able to cope with it. Although this seems to be an issue in the literature, the respondents do not see this very much as a problem yet. Installing solar panels on the roof is often enough for companies and when it is not, a new connection to the electricity network is generally not a problem. However, in the future this might be a problem, because the energy demand is rising quite firmly. Thus, even though companies do not have problems with their network connection at the moment, it still could be a good idea to include it in future hub policies.

Water bound locations are mentioned in literature as well. These locations could play a part in relieving the road network and more sustainable distribution. As for the interviews, hub companies and municipalities recognize the chances that distribution by water could bring in the future, but they do not require water bound locations just yet. They especially see chances for water bound construction logistics hubs. When developing hub policies, it could still be sensible to include water bound locations in it. Distribution by water is not fully developed yet, but the development of urban distribution hubs is still in its early days as well. When including distribution by water in hub policies, the chances that water bound locations could bring can be better utilized.

5.2 Urban distribution hub policies

The second sub-question is *'What are the current hub policies of Dutch municipalities that are implementing a ZE zone?'*. This sub-question takes a look at the current hub policy design of municipalities: what are the aims, objectives and targets that municipalities want to achieve and have they included all five aspects of transport policy? Or are these aims, objectives and targets still not quite clear in current hub policies? Besides the internal policy design process, the external input (aims and objectives) plays a role as well. This input mainly consists of the national government that has signed the Climate Agreement, after which several municipalities joined to cooperatively implement ZE zones. This external input provides a starting point for the hub policy design and will be discussed first in this paragraph.

ZE zone

This research' focus is on municipalities that are implementing a ZE zone. In the Netherlands, around 35 municipalities will implement this zone in 2025. From then on, logistics in their cities will change. Municipalities are implementing this zone mostly for environmental reasons, that will have an effect on the liveability in the city. ZE zones are particularly expected to reduce pollution, but some municipalities are also expecting them to lead to a reduction in vehicle movements. This expectation arose from the idea that more companies will make use of a consolidation hub. Most municipalities however – and companies as well – think that the introduction of the ZE zone will not contribute to an increase in the use of a hub. By electrifying their fleet, companies will still be able to drive into city centres. In terms of the conceptual model, this means that the (external) objective of the implementation of the ZE zone does not lead to the same aim for every municipality. While most municipalities see reduced pollution as the main aim, some also expect a reduction of vehicle movements.

Most municipalities want to achieve both aims: reduction of pollution and vehicle movements. To be able to achieve both, municipalities are combining other measures or targets with the introduction of the ZE zone. According to the municipalities, these combinations will have a greater chance in succeeding in reducing vehicle movements. Measures that are implemented are for example broader time windows for electric vehicles, exemption policies, and car discouraging policies. All these three objectives fall under the authority type of governing instruments. In the literature, measures like these are discussed, but their exact impact mostly remains unclear. Evaluation of the policy measures is frequently done quite poorly, which means that the policy cycle ends at the last step, instead of providing input for a new first step of a policy cycle. However, since these measures are mainly focusing on access of certain vehicles and excluding others, the impact will not be a reduction of vehicle movements per se. Just like the implementation of the ZE zone – which is an access policy for certain vehicles as well – the main focus of these policies is on replacing polluting vehicles by clean(er) vehicles. However, when access policies are effective on all of the vehicles, reduction of vehicle movements would be accomplished.

Besides reducing vehicle movements and reducing emissions per vehicle, there is a third way in which changes in transport can reduce CO₂ emissions in a city. In the literature these three pillars are called 'trias mobilica'. These three possibilities to reduce CO₂ emissions, are placed in a certain order. The first step of reducing emissions is to reduce the amount of vehicle movements. This pillar focusses on efficiency: skip unnecessary travel movements and improve the vehicle load. Bundling goods fits into this category. The second pillar focusses on modal shift, which is the change from a certain vehicle to a more environmental friendly vehicle (e.g. cargo bikes). The last step is making vehicles cleaner. This is the pillar where ZE zones contribute to. Although this pillar has the most potential for CO₂ reduction, the other two steps are higher on the trias mobilica pyramid. Especially the second step – modal shift – is sometimes overlooked by municipalities. Cargo bikes, for instance, have a high potential in taking over urban distribution volume that is now delivered by (electric) vans.

Consolidation hub

Most literature sources point out that the use of UCCs is the best practice for sustainable urban logistics. These hubs will not only lead to traffic reduction, but will reduce CO₂ emissions as well. According to companies and municipalities, the introduction of ZE zones will make more companies using a hub to some extent, but not very much. Additional commitment from municipalities is necessary to increase the amount of customers for UCCs. The main additional measure – or policy

target – where these hub companies are thinking about is including the use of hubs in municipalities' tenders. This means that the logistics flows of municipalities have to be delivered via a consolidation hub. When the use of a hub – or bundling – is included in a tender, other companies cannot drive into the city centre with an electric vehicle that is half empty. So, the objective of this target is the reduction of vehicle movements in the city. The type of governing instrument of this objective is, again, authority.

Municipalities acknowledge that this measure can indeed cause a reduction of vehicle movements, although they are holding back a little. Especially including the use of a hub in a tender already seems to be too big of a step for municipalities. Municipalities are unsure if this will lead to unnecessary higher prices, unfair competition or the exclusion of certain companies. Companies, on the other hand, point out that it brings a lot of chances for municipalities to work towards their sustainability goals. Not only facility flows should be included in tenders, construction logistics can also play a huge part. This idea corresponds to the literature. In these two sectors, there is a lot to gain when it comes to bundling. Hub inclusion in a tender can help to get a higher bundling ratio and in addition ensures a higher turnover for UCCs as well.

Facilitate hubs

Although municipalities are quite reluctant towards including the use of a hub – or bundling in general – in a tender, they still want to work towards a more liveable city. To a certain extent, every municipality is facilitating hubs. For some municipalities this especially comes down to communication between local companies, while others use a lot more measures to facilitate hubs. All municipalities see communication and bringing parties together as a role for the municipality – or at least they provide it. Setting up a hub, however, is a task that municipalities do not see for themselves but for market parties. As for other ways to facilitate hubs, municipalities have different views and do different things. While some municipalities are actively seeking locations with possible hub companies, others outsourced their facility logistics to an UCC. When it comes to governing instruments, nodality is favourable. The role of the government as a party that provides information about hubs and brings parties together seems to be the main governing instrument. Organization, on the other hand, is not pursued by any municipality: no municipality wants to set up hubs themselves. The ideas about the governing instruments of authority (law) and treasure (money) differ between the municipalities. Some are in favour of these instruments, while others are against it.

Hub policies

Still, this does not always mean that municipalities have hub policies. An overarching view towards hubs and facilitating hubs is in most cases missing. And even if there is a view towards hubs, this does not always include all the facets of urban hub policy. A few municipalities acknowledge that there has to be hub policies first, before it is possible to steer towards a certain direction. When municipalities for instance prefer not to have dedicated hubs on greenfields in their city, creating hub policies can help to reject these companies.

According to the literature, both contemporary as future needs need to be considered when making urban logistics policies. When doing that, five trends and changes should be included in urban logistics policies: reduction of the negative impact on the environment, the transformation to a low-carbon economy, the increase in demand for urban freight transport, increase in innovative solutions (e.g. electric vehicles), and the development of ICT solutions. The current measures that municipalities are taking regarding urban transport, are especially including environmental trends in it. The wider access to electric vehicles has the main focus in urban logistics policies, by which the negative impact on the environment and the transformation towards a low-carbon economy is tried

to accomplish. The increasing demand for freight transport and the development of ICT solutions are less often included.

As an indication, Groningen is quite an exception amongst most municipalities, by planning to include future ideas (the implementation of micro hubs) in their hub and logistics policies. Leiden on the other hand tends a little more towards ICT-solutions and smart ways to cooperate. Nevertheless, none of the municipalities really has an overarching policy, where all five aspects are taken into account. Especially the increasing demand for urban freight transport could be included more prominently. This increasing demand, which mainly will be in the B2C-branch, could result in even more vehicle movements in the future. Currently there is no municipality that really has a view on how to cope with this trend.

Collaboration

A final point of interest for hub policies is standardization. Several authors mention the importance of distinctness and standardization in urban logistics policies. In two of the five districts in the Netherlands – District North and District East – an overarching policy for hubs and urban distribution will be constructed. This leads to standardization of measures in that area, which is very helpful for local entrepreneurs. Although all municipalities have some sort of collaboration with adjacent municipalities, a partnership on a higher level is not of frequent occurrence. In District East, for example, are seven municipalities that are implementing a ZE zone, with another fifteen that want to take advantage out of the districts developments regarding hubs. With a collaboration like this, it is easier to create a standardized approach towards urban distribution in a region.

Municipalities are doing well when it comes to including stakeholders in the process of creating hub policies. All municipalities have a lot of stakeholder meetings and are very active in communication towards companies. Especially the contact with logistics companies is quite good, while the city centre entrepreneurs sometimes can be a little bit overlooked. Altogether, this part of making policies seems to be going well.

5.3 Efficient implementation of hubs

The final sub-question is *‘What are the opportunities for a more efficient implementation of urban distribution hubs?’*. Based on the interviews, a few possibilities for efficient land use emerged. The three main solutions will be discussed to provide an answer to this sub-question. In the literature, not very much is mentioned about efficient land use regarding urban distribution hubs. The only literature that can be found of hubs and land use, is regarding to clustering multiple consolidation hubs. This mainly focusses on the integration of supply chains rather than efficient use of space, so the focus in this sub-question will mainly be on findings from the interviews.

Multi-layer

One of the suggested possibilities are stacked buildings. This could be building a multi-level hub or placing another function on top of the hub. Building a hub with multiple levels is not desired: hubs are mainly used for cross-docking, which will be a lot harder when a building has multiple levels. A possibility could be to have the office spaces of the hub on the top floor. For urban distribution hubs, this will probably not save enough space, though. Building a parking deck for cars of hub employees could also be an option. The opinions on this option are quite differing: some companies and municipalities see this as a possible option, where others are a little more sceptical. The construction of a parking deck will not save enough space, according to some interviewees. Besides that, a parking deck construction is very expensive. Only when there is very much need for a hub space and there is

not much available, building a parking deck is considered an option. In Amsterdam, for example, this is seen as a more realistic option than in Groningen.

Another multi-layer possibility could be the implementation of another function on top of a hub. Multiple options were mentioned for this, varying from sports fields and recreation spaces to businesses and offices. For all of these options, some disadvantages were mentioned that made the implementation quite unrealistic. The only thing that seems practically feasible is installing climate adaptation features. Solar panels and green roofs do not have the disadvantage of attracting other logistics streams, whereas other functions do have that. Sports fields or businesses, for example, attract people to the building and create even more traffic around the building. The overlap of different logistics streams around a hub do not seem to be sensible. Altogether, multi-layered buildings are possible, but are not very realistic at the moment.

Clustering

Clustering seems to be more realistic, but does not save as much space as multi-layered buildings. As mentioned in the literature as well, clustering mostly has advantages regarding business processes. These advantages are recognized by municipalities and companies. For both UCCs and dedicated hubs, it can be beneficial to have a cluster of related companies nearby. When it comes to efficient land use, clustering has some small advantages too. For instance, the outdoor area can be a shared area between different companies. This makes it possible to shift between the required outdoor spaces of different companies. Besides that, a clustered investment is more attractive for investors. The implementation of a parking deck will for instance be a little bit more realistic when four hubs are built at once. However, the available land is very scarce, which makes an investment with four buildings at once even more difficult.

Redevelopment

Many municipalities, especially the municipalities in the Randstad area, do not really have space available. In municipalities outside of the Randstad area there is just a little bit of land available, but these plots are mainly on the outskirts of the city. Empty logistics plots near the city centre are in all interviewed cities very scarce. When there are some plots available, municipalities are not very eager to sell this to dedicated hub users. Although dedicated hubs are providing a lot of working spaces compared to their building size, they also use a lot of outdoor space.

Municipalities are more likely to provide available land when dedicated hub users are aiming for a brownfield location. This helps municipalities to achieve their redevelopment goals and it contributes to economic goals (employment opportunities) as well. When municipalities have greenfield and brownfield locations in own management, they are able to steer a little bit towards brownfield development. However, municipalities often do not have much land themselves. For them to still be able to steer towards brownfield developments, they need urban hub policies. Most municipalities acknowledge this and are currently developing hub policies or will start to develop them in the near future.

For UCCs, these redevelopment locations are mostly not feasible. If they are moving to a new location, they will often just move into an existing building or move in with a logistics company. Some of these companies have some unused space in their warehouse, which can be used by an UCC. This provides opportunities for municipalities to facilitate these combinations with logistics companies. By doing that, municipalities are working on their sustainability goals, but do not have to provide any new plots for logistics. In fact, most of these logistics warehouses are being revitalized when another company rents the unused spaces, which also helps upgrading the look of a business park.

Land prices

Wrapping up, multi-layer buildings and brownfield developments are mainly municipalities' wishes for hub developments. When it comes to the hub companies themselves, they will just look for a suitable location for their business. Redevelopment and multi-layer buildings are only becoming options when greenfield locations are not available. This is mostly due to the low land prices. Building a parking deck or redeveloping a brownfield location is more expensive than buying a bigger greenfield location and fill it with a lot of asphalt. Maybe in Amsterdam, the construction costs of a building with multiple levels can outweigh the savings on land prices. For other cities in the Netherlands, this does not seem to be the case (yet). Examples of multi-layer hubs in Paris, for example, are not very likely to be seen in cities like Groningen or Nijmegen soon. Therefore land prices are just too low.

Still, municipalities would like to steer a little bit towards brownfield developments. But only when greenfields become scarce or are not on the optimal locations, companies will consider other options. For municipalities, it can therefore be helpful to set up hub policies. With these policies, companies can be pushed a little bit towards brownfield developments, or will only get a greenfield location when they meet certain requirements.

5.4 Urban distribution hub policy design

The answers of the three sub-questions have provided a lot of insights about the theory. In this paragraph, all findings that have its reflection on the main theory of urban distribution hub policy design will be put together. To create urban distribution hub policies, there have to be clear targets and objectives, corresponding to a certain aim. Besides that, all five transport policy aspects have to be considered at least. This can also mean that the decision is made to do nothing with a certain aspect and leave it to the market, for instance. Still, that is a decision, which means a policy choice is made. Another important thing to keep in mind when designing hub policies, are the external objectives and aims, regarding the ZE zones and the climate agreement, respectively. Although the objective of the implementation of the ZE zone is apparent in all municipalities, the corresponding aim does not always seem congruent. Lastly, practical insights from hub users can provide helpful guidelines for hub policy. Currently, municipalities are in different stages of developing hub policies. Some are still orientating, others have already implemented some measures. However, none of the municipalities have a complete vision towards urban distribution hubs, regarding the policy targets, objectives and aims, while including all five transport policy aspects in it as well.

When designing public policies, the policy aim has to be determined first. All municipalities want to have a more liveable city with a low amount of emissions. There are different aims that correspond to that, which can be divided into three categories. These categories match the three steps of the trias mobilia. The first step is to reduce the total amount of vehicle movements. This is followed by changing the vehicle that makes the movement, while the third step focusses on making the current vehicle movements cleaner. In other words, the three steps are the reduction of all vehicle movement, reduction of car movement and the reduction of conventional vehicle movements. It is possible to have multiple aims and to strive for both fewer vehicles and cleaner vehicles, for example. However, every target suits a different objective, which connects to different aims. For all these three different aims, the conceptual model will be filled in to create an overview of the possible targets that correspond to the different aims and objectives. An overview of all measures that have an impact on the amount of freight vehicles can be found in appendix E.

Reduction of vehicle movement

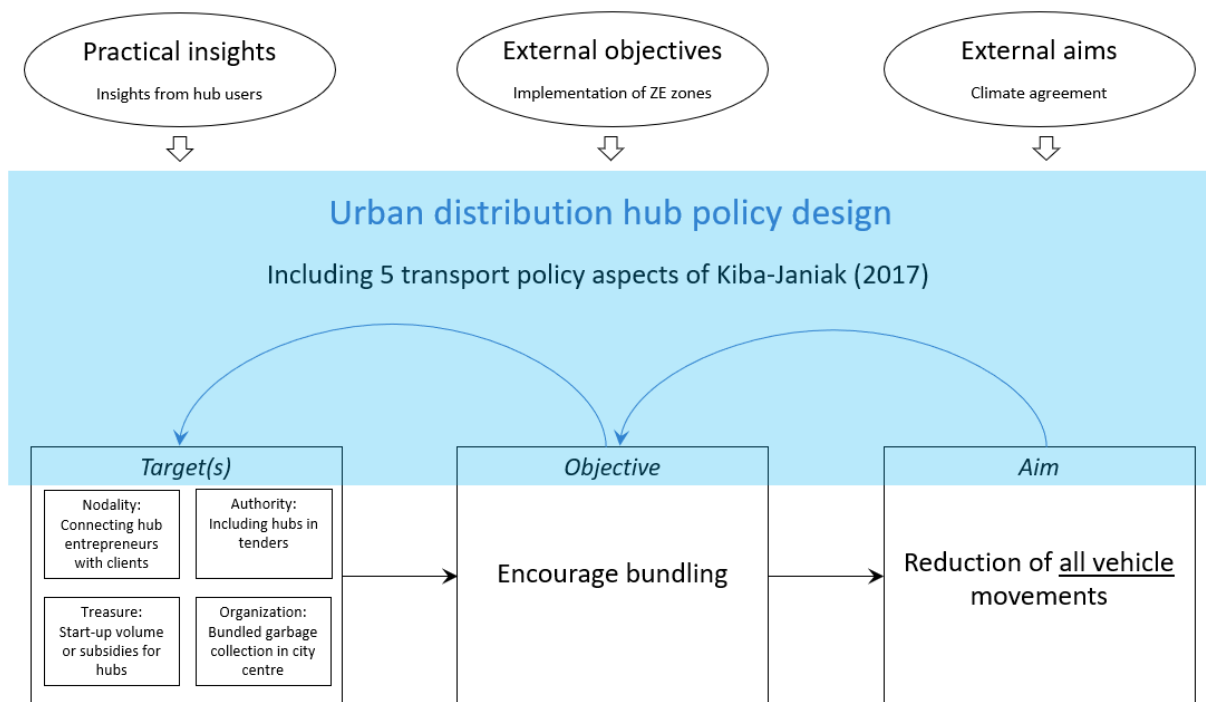


Figure 9 - Model of public policy design with the reduction of all vehicle movements set as an aim (own work)

The first aim is the reduction of vehicle movements and is the first step of the trias mobilica. When this is set as an aim, encouraging bundling could be the corresponding objective. For this kind of aim and objective, nodality governing instruments predominate. These are measures where information is involved, for instance when municipalities try to make connections between hub entrepreneurs and hub clients. UCC entrepreneurs however, point out that treasure objectives can be very helpful for them. Not all municipalities are very willing to provide money though, for instance through subsidies. According to UCC entrepreneurs, even a small amount of money can be very beneficial for them. A start-up subsidy, for example, could just be the policy target that gets them on track. The same applies for providing a start-up volume, which in fact comes down to providing a start-up subsidy as well. Including hubs in tenders could be an effective authority target. This target ensures that all deliveries have to be bundled. Especially for facility and construction logistics, this measure has a relatively high potential. Lastly, municipalities could organise bundling themselves by providing it as a public good. All municipalities in this research reacted negatively towards setting up hubs themselves. There is a measure that falls into the organization category and is integrated in the urban system, which is the collection of garbage. This bundled collection of garbage is a semi-public responsibility and is in most cases already implemented.

Reduction of car movement

The second step is aiming for a modal shift away from cars and vans, but towards public transport for example. In the case of urban distribution hubs, encouraging transport by boats and cargo bikes is a fitting objective here. These objectives are mentioned in the literature as promising measures, but are sometimes a bit overlooked in practice.

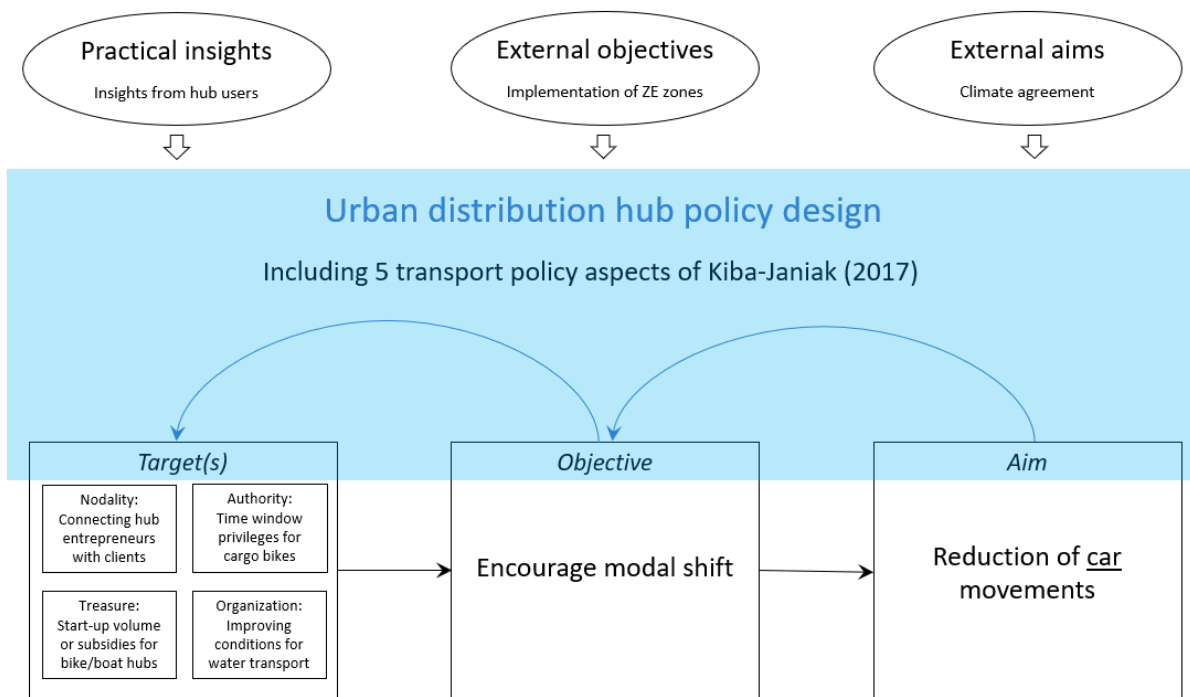


Figure 10 - Model of public policy design with the reduction of car movements set as an aim (own work)

Some targets have some overlap with the previous targets, matching the bundling objective. This is due to the fact that encouraging a modal shift mostly means that a company that is providing distribution by bike or boat is supported. These companies not only replace the deliveries that were previously done by cars one-on-one, but mostly bundle these deliveries too. Since the goods are delivered by freight vehicles and are distributed by bikes or boats, there is already a crossdocking activity taking place. Combining this with the consolidation of goods is just a minor step in this crossdocking process.

Hence, the nodality and treasure measures are the same as in the previous policy design model, although they are now focussing on bike or boat hubs specifically. As an authority measure, time window privileges for (cargo) bikes could be an option. When bikes are allowed to enter a city centre in the afternoon while cars are not, inner city entrepreneurs are more likely to make use of a cargo bike hub company. Finally, the organization measures are those that focus on improving the conditions for transport by bike or water. Building bicycle lanes and paths helps bicycle delivery companies to be at their destination sooner. The same goes for transport by water: when more canals and rivers are suited for boats, boats do not have to make detours to bypass bridges that are too low, for example.

Reduction of conventional vehicle movement

The third trias mobilica step is making the current vehicles cleaner. This step or aim is most present amongst the municipalities. Aiming for electric vehicles, with the introduction of the ZE zone for example, is widely applied by the interviewed municipalities. Authority measures are most applied to fit this objective. Apart from the implementation of the ZE zone, providing privileges for electric vehicles is a common measure. Wider time windows, looser exemption policies and allowing electric vehicles on bus lanes are all examples of applied authority measures. While most municipalities believe that these measures mostly contribute to less pollution, a few municipalities also believe that the implementation of the ZE zone will also lead to more bundling and lesser vehicles. According to the theories and the conducted interviews, this might not be the case. The implementation of the ZE

zone will definitely help to reduce pollution, but to reduce the amount of traffic in the city, other measures have to be taken.

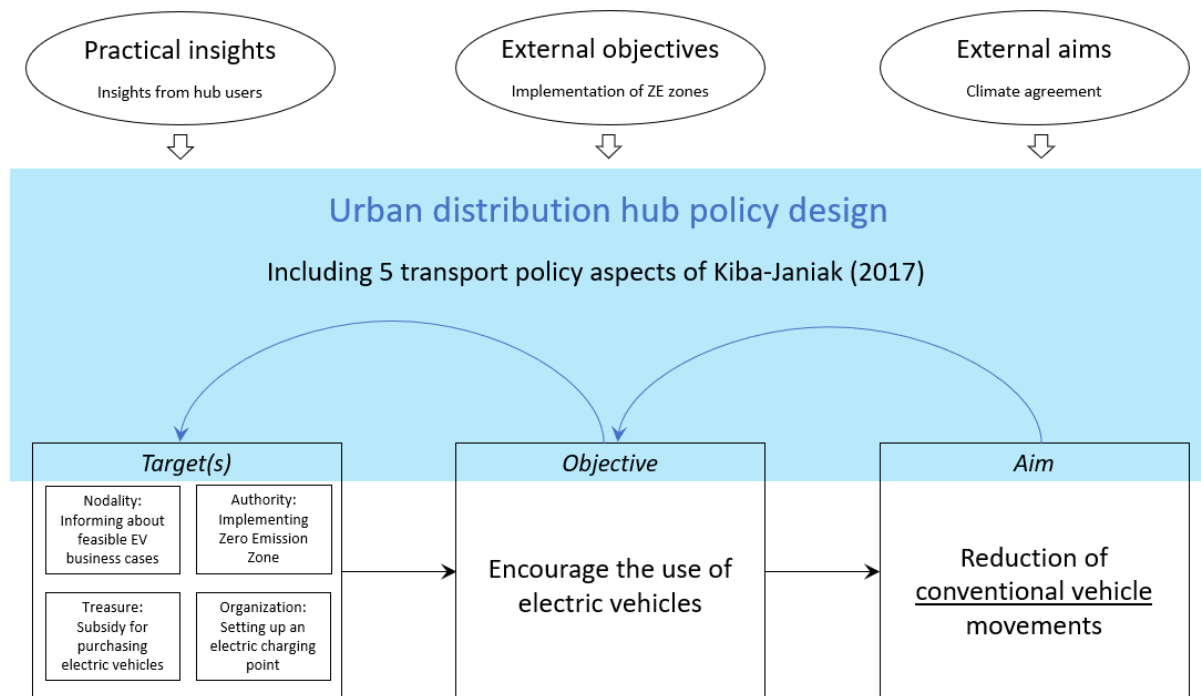


Figure 11 - Model of public policy design with the reduction of car movements set as an aim (own work)

Not only authority measures can encourage freight carriers to use electric vehicles instead of conventional vehicles. Organization measures are for instance another type of measure that suits the objective quite well. The development of areas for electric charging can get entrepreneurs to use an electric vehicle more easily. Some municipalities are also informing local entrepreneurs about the possibilities for feasible business cases with an electric vehicle. For some local entrepreneurs it can be quite interesting to purchase an electric vehicle, although they oftentimes do not have the time or knowledge to find out whether the business case is feasible for them. As a final step, financial aid might also steer entrepreneurs to buying an electric vehicle. This could be done with subsidies, for example.

Efficient use of urban space

Another policy aim that municipalities have in some cases, is the aim for preventing dedicated hubs to build on a greenfield location, but selecting a brownfield instead. Currently, there is not really a legal basis that municipalities have to make this happening. An urban distribution policy could be an opportunity for municipalities in this case. Some municipalities already completely ban dedicated hubs from their municipalities, but this may not be the most sustainable solution. As Kiba-Janiak (2017) states, municipalities should be thoughtful of the growing demand for urban transportation. Prohibiting dedicated hubs to settle in the municipality will lead to a bigger stream of goods from outside the municipality towards it, since the demand for those goods will still be present. Besides, when vehicles have to drive further, chances are that driving electrically to the city is less beneficial for these companies. This growing demand is an aspect that seems to be quite overlooked by the municipalities, alongside with the development of ICT solutions in the urban transportation field. On the other hand, innovative means of transport, a transformation to a low-carbon economy, and reducing the negative impact on the environment are better thought of.

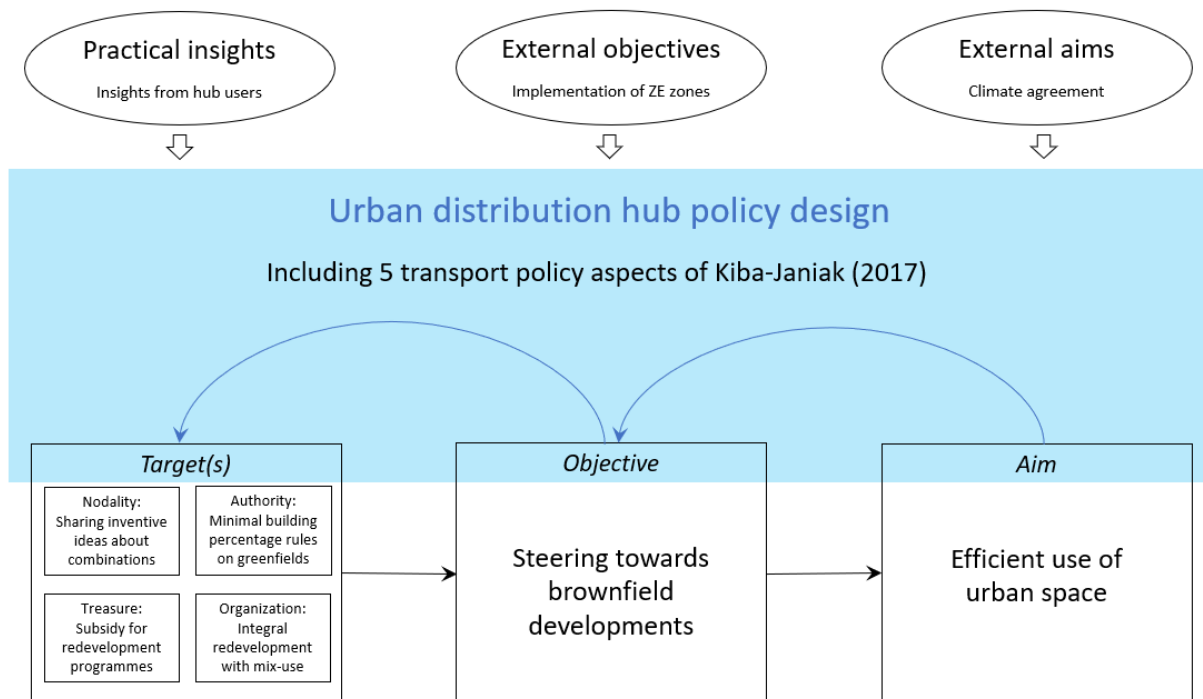


Figure 12 - Model of public policy design with efficient use of urban space set as an aim (own work)

When steering towards brownfield developments is set as an objective to fulfil the aim of making efficient use of urban space, there are again four types of possible measures that could be taken. A nodality measure could be that the best practices of companies that have combined forces are shared. This could for instance be when a company that has some unused warehouse space rents this space to a start-up hub company. This could be an inspiration for both companies with unused warehouse space and companies that are looking for a place to start their business. An authority measure could be that a minimal building percentage on greenfield locations is required. This prevents dedicated hub users to buy a greenfield location and build on only 30% of the plot. These companies are now forced to redevelop a brownfield or make a stacked building or parking deck. Other possibilities for municipalities to steer towards brownfield developments are providing financial resources to project developers or redeveloping a brownfield location by themselves. When doing this, an integral redevelopment framework might be fitting to create both residential areas and spaces for companies in one redevelopment project.

6 Conclusion

In this chapter, the main question is answered. This is done using the answers of the sub-questions from the previous chapter. After answering the main question, a reflection and some recommendations for practical use and further research are included.

6.1 Main question

The main question of this research is *'How can the usage requirements of urban distribution hubs and the hub visions of local governments be combined to form clear and realistic hub policies?'*. Three components of this questions are investigated in sub-questions. A few ideas and directions on creating hub policies emerged from these sub-questions.

By conducting interviews with municipalities, it became clear that municipalities mostly do not have complete hub policies (yet). Hub policies are still being developed or are not present at all. However, municipalities are taking measures to facilitate hubs to a certain extent. Some municipalities are mainly focussing on bringing parties together and provide clear communication, while others are actively seek for locations and financially support hubs. In some cases, those policy targets are already active, while the policy aim is not clear yet. A clear hub policy is needed to give some direction to the measures and to be able to steer towards certain spatial hub developments.

To design hub policies, it is important to know what the desired direction or the municipalities' view is towards urban logistics. What aim does the municipality want the policies to achieve exactly? The trias mobilia could for instance be a starting point for this, by deciding which of the three steps become(s) the policy aim. Municipalities could for instance primarily focus on making the current vehicle flows cleaner. The implementation of the ZE zone will mainly contribute to this. The amount of vehicles will probably not decline that much, but the emissions that these vehicles provide will be reduced in particular. Measures like wider time windows for electric vehicles fall in this category too. For the other two pillars of the trias mobilia, other measures are needed. The middle piece of the pyramid aims at accomplishing a modal shift. By focussing on this pillar, the total amount of vehicle movements will not change per se, but the distribution will be done by other modalities. Distribution by water could be a chance here, or shifting the focus on cargo bikes. These measures will both lead to less congestion on the cities' road networks too.

On top of the trias mobilia pyramid are measures that focus on reducing the total amount of vehicle movements. This mainly comes down to bundling or consolidating. The implementation of urban distribution hubs fall in this part of the trias mobilia. UCCs are in particular contributing to reducing the amount of vehicle movements, because these hubs provide consolidation of different urban logistics flows. There are quite some differences in the current stance of municipalities towards hubs, especially when it comes to facilitating hubs. Some municipalities leave the implementation of hubs to the market as much as possible, while others are taking responsibility and support hubs in multiple ways. This research shows that UCCs can be very beneficial for reducing the amount of vehicle movements in the city, but they might need some help in their start-up phase. Start-up phases of UCCs are quite costly, while the income of these hubs still is rather low. For the start-up period, UCCs prefer to have a combined hub with a logistics company or have a parallel business themselves.

There are two main ways in which municipalities can support UCCs in their start-up phase. First, creating enough volume is a requirement for a hub to exist. Municipalities can facilitate by including obliging the suppliers of their facility products and construction logistics providers to consolidate their logistics flows. This could be done by directly stating in a tender that the use of a hub is required, or bundling in general. In that last case, logistics providers can also arrange bundled

transport themselves and they are not obliged to use a hub. The disadvantage of this is that there is no creation of volume for an UCC. Secondly, municipalities can facilitate UCCs in finding a location for their business. During the start-up phase, UCCs prefer to be on small locations, together with other companies or logistics providers. By making this connection with logistics providers, municipalities can support the start of an UCC.

When it comes to dedicated hubs, there is usually no need for facilitation in such a way. Dedicated hubs have more financial resources, so financial help is not desired. What is desired though, is a suitable location for their hub. A little bit of friction exists here between the dedicated hub usage requirements and the desires of municipalities. For municipalities, the settling of a dedicated hub could provide a lot of employment, which is positive for municipalities. However, dedicated hubs often use a lot of outdoor area and municipalities are not very willing to provide that much space for a relatively small building. On top of that, dedicated hubs are most likely to settle on greenfield locations. Due to the relatively low land prices, building on a greenfield location is cheaper than redeveloping a brownfield location and is therefore preferred by dedicated hub companies.

Municipalities much rather see these companies settle on brownfield locations or build a multi-layer hub – preferably both. This research shows that building a multi-layer hub brings a lot of disadvantages and is not very realistic with current land prices for greenfield locations. There are however possibilities for municipalities to steer towards brownfield redevelopment. When municipalities create a framework, it is possible to set conditions for building on a greenfield location. A building percentage of 50% could for instance be required. On top of that, building on greenfield locations at all could be rejected, which pushes the dedicated hub users towards brownfield locations automatically. A sidenote by setting these requirements is that it could be possible that dedicated hub users prefer to settle in neighbouring municipalities.

Finally, the creation of an overarching, regional framework for hubs is desirable for both transport companies and hub users as municipalities themselves. For instance, examples like this sidenote are not possible anymore, because the same policy targets apply to the whole region. Other advantages for municipalities are that it is easy to share expertise and do research on regional hubs. Besides, the province has resources to support both municipalities and companies. This last advantage is also an advantage for hub users, as well as the creation of clear guidelines that are the same in a whole region or district. This standardization could be very beneficial for companies in the whole transportation sector.

So, how can the usage requirements of urban distribution hubs and the hub visions of local governments be combined to form clear and realistic hub policies? To put it shortly, this can be done by first of all determining what the policy aim will be. When it is desired to reduce vehicle movements, facilitating one or multiple UCCs can contribute to that. This facilitation can for instance be done by bringing companies together or creating a starting volume for the UCC. When it comes to dedicated hubs, focussing on brownfield developments seems to be an option. A policy framework regarding hubs can help steering towards these brownfield developments. Finally, setting up an overarching framework with a province or district can be very beneficial for both municipalities and local companies. It provides standardization and an equal playing field in the whole region.

6.2 Reflection

During the process of conducting this research, the main focus and subject of the thesis has changed quite a few times, which has had its reflection on the overall process. In some way it has affected the scientific and social relevance as well. This paragraph will focus on the internal and external influences that affected the research process, and what the effects for the research outcome are.

First of all, this research is written both as a thesis and an internship project. Due to its duality in structure and interests, this sometimes led to a situation where the practical meaning of the research became of a bigger importance than the scientific relevance. Although there is tried to find the right balance between these two components, this might have influenced the research process. This is not a negative or non-scientific influence per se, but it has to be kept in mind that the societal relevance and the practical adaptability of the outcomes occasionally dominated the process.

Apart from that, the main focus of the thesis has shifted a bit during this research process. At first, the focus was mainly on the limited availability of urban space and how differentiating the urban distribution hub constructions could help dealing with that. Although the dual structure of urban hub users and municipalities was already apparent from the beginning, the main focus initially was more on the hub users' perspective. The idea was that a nationwide database of all existing hubs was to be created, to be able to do quantitative analysis. This quantitative analysis, together with the qualitative input from interviews with municipalities, could have brought more depth to this research. Besides that, the external validity would also be higher, since the quantitative analysis could provide another perspective. Unfortunately, due to both a lack of data and time availability, this side of the research had to be skipped. To be able to have different perspectives on urban distribution hubs, more interviews with urban distribution hub users than initially planned were conducted, to still cover the hub user side as well. Nevertheless, since only eight urban distribution hub users were interviewed, the findings on that aspect cannot be generalized.

In this research, a decision is made to focus primarily on municipalities that are planning to implement a ZE zone. This is mainly due to the fact that urban distribution hubs are still quite a new phenomenon – relatively – and are especially present in the bigger cities. For most municipalities, urban logistics is a relative new phenomenon and there are not high detailed plans for it yet. The future implementation of a ZE zone does already set municipalities thinking about the urban logistics in their municipality, though. For this research, these municipalities were chosen, because the estimation was that if there were municipalities that had already thought about urban distribution, that would be these cities. For cities that are not planning to implement a ZE zone (yet), urban distribution might be less of a theme and is less thought of. Besides that, the equal factor of a ZE zone implementation led to the possibility to make statements about the differences and similarities between municipalities. However, this choice made it impossible to analyse whether the assumption that cities without a ZE zone have minor municipal interest in urban distribution is true.

A final point to mention is that urban consolidation centres have quite a lot of differences compared to dedicated hubs. Although these hubs are both used to transfer goods from a bigger vehicle into a smaller one, they are almost not comparable. For this research, both concepts were analysed to create a full picture on urban distribution and urban distribution hubs, but this also led to difficulties. During the interviews, for example, it was not always clear what idea the respondent had by an 'urban distribution hub' and if he or she thought about it as an urban consolidation centre, a dedicated hub, or both. This distinction should have been presented clearer during the interviews. Apart from that, by focussing on just one of the two concepts, the questions in the interviews could have been even more focussed and the interviews – with both hub users and municipalities – could have provided more insights on one of the two. On the other hand, this setup has provided some insights on both concepts, which could serve as the basis for further research.

6.3 Recommendations

Although some ideas for further research were already touched upon in the previous paragraph, this paragraph will finalise this research by presenting some ideas for further research. After that, recommendations for practical use of this thesis will be given.

6.3.1 Recommendations for further research

Elaborating on the reflection, this sub-paragraph will provide some ideas and directions for further research. First of all, including municipalities that are not planning to implement a ZE zone could provide interesting insights. For instance, are there differences between the way urban distribution policy is approached between municipalities that will and will not implement a ZE zone? Besides that, including non-ZE zone municipalities ensures that smaller towns and more rural areas could be included as well.

Another recommendation is to focus more on the user side. Developing the database of all urban distribution hubs could be a way to do this. A database as such could provide quantitative insights on the average distances to the city centre and to main roads and could include building sizes, number of loading docks and outdoor area size, for example. This geodata could be analysed with ArcGIS or gained by taking surveys. When doing this, a differentiation could be made between the different hub sectors. Another important distinction is – again – between dedicated hubs and UCCs.

In future research it could also be an option to focus more on new trends. In this research, municipalities and hub users stated that distribution by water is still in its early days and has to be developed. However, distribution by water seems to be quite promising for the future. This also means that there will be a bit more emphasis on the second trias mobilica step. That step was the least apparent step of the three in this research. Focusing more on modal shift will cover that gap. Another possibility is to focus on other trends that could affect urban distribution. For instance, the superfast grocery delivery businesses that popped up recently, might be an interesting case. What are their preferred locations? Do they want to be even closer to their sales market and attach less value to a near connection to main roads? Another trend that could have an effect on urban distribution, or in any case urban space, is the growing demand for housing. At the moment, combining residential functions with logistics does not seem feasible and desirable. Maybe the growing pressure on urban space will change that and make mixed urban development possible. In Paris this mix-use is already being implemented, but the Netherlands does not seem to be ready for these ideas yet (Nefs & Soret, 2020). Researching this development and the possibilities for implementation in the Netherlands could provide a lot of chances for an efficient use of urban space.

6.3.2 Recommendations for practical use

At the end of this research, some recommendations for practical use of this research will be given. First of all, the conceptual model could be helpful for municipalities when they are designing urban distribution policies in general, or hub policies specifically. The conceptual framework provides a clear visualisation of the steps that have to be thought of. Although the targets are the actual municipal measures, the policy design process starts by defining the right aim. For that point, the objective and possible targets can be defined. Even though this research indicates the corresponding target for each objective and aim, multiple aims and objectives can be implemented in an urban distribution policy. It could be that the main focus is on reducing vehicle movement in general, but that there will be made efforts in reducing the amount of conventional vehicles as well. This is not wrong – in fact, this might both fulfil the purpose of making a city more liveable. However, whenever implementing policy measures, the corresponding objectives and aims always have to be kept in mind. Appendix E provides some examples of measures and their corresponding objectives and aims.

In the recommendations for further research, a possible division between research on dedicated hubs and urban consolidation hubs came up. This division also goes for the practical use. Policy design for dedicated hubs brings a lot of different aspects in comparison to urban consolidation hubs. When designing the policies, it would be recommended for municipalities to consider these two concepts as really different. On the one hand, dedicated hub policy design should be focussed on finding the right way to manage both the almost inevitable growth of vehicle movements into the city and the claims on urban space that dedicated hub users make. Totally ignoring the needs of the dedicated hub users does not seem wise, since demand will only grow in the next few years and the vehicles will otherwise just drive to the city from outside of the municipality. Besides, dedicated hubs can provide quite some employment opportunities. On the other hand, not setting any rules for greenfield development of dedicated hub users is not recommended too. The low building percentages of the dedicated hubs are the cheapest option – if possible –, but building a parking deck or building on brownfield locations are options for them as well. However, stacked buildings with multiple users, sports fields on top or even combining a hub with residential functions do not seem feasible options. By any means, not yet. The developments in urban distribution are continuing rapidly and in a few years, this could be totally different. But for now, starting with smaller implementations seem more reasonable than aiming for futuristic concepts.

References

- Agrebi, M., Abed, M. & Omri, M.N. (2015). Urban distribution centers' location selection's problem: A Survey. *2015 4th International Conference on Advanced Logistics and Transport (ICALT)*, Valenciennes, France, 246-251.
- Akgün, E. Z., Monios, J., Rye, T., & Fonzone, A. (2019). Influences on urban freight transport policy choice by local authorities. *Transport Policy*, 75, 88–98.
- Alho, A., Bhavathrathan, B. K., Stinson, M., Gopalakrishnan, R., Le, D. T., & Ben-Akiva, M. (2017). A multi-scale agent-based modelling framework for urban freight distribution. *Transportation Research Procedia*, 27, 188-196.
- ALICE/ERTRAC (2014). *Urban Freight research roadmap*. Brussels: ERTRAC.
- Allecijfers.nl: De grootste gemeenten in inwoners in Nederland*. (2021, 17 augustus). Alle Cijfers. <https://allecijfers.nl/ranglijst/de-grootste-gemeenten-in-inwoners-in-nederland/>
- Anderson, S., Allen, J., & Browne, M. (2005). Urban logistics—how can it meet policy makers' sustainability objectives?. *Journal of transport geography*, 13(1), 71-81.
- Ballantyne, E. E. F., Lindholm, M., & Whiteing, A. (2013). A comparative study of urban freight transport planning: addressing stakeholder needs. *Journal of Transport Geography*, 32, 93–101.
- Black, T.R. (1999). *Doing Quantitative Research in the Social Sciences*. London: SAGE.
- Bobrow, D. B. (2006). 'Policy Design: Ubiquitous, Necessary and Difficult'. In B. G. Peters and J. Pierre (eds), *Handbook of Public Policy*. London: Sage, pp. 75–96.
- Boer, E. den, Kok, R., Ploos van Amstel, W., Quak, H. & Wagter, H. (2017). *Outlook City Logistics 2017*. Delft: Topsector Logistiek.
- Bok, M. de, Tavassy, L., & Thoen, S. (2020). Application of an empirical multi-agent model for urban goods transport to analyze impacts of ZE zones in The Netherlands. *Transport Policy (in press)*.
- Browne, M., Nemoto, T., Visser, J., & Whiteing, T. (2004). Urban freight movements and public-private partnerships. *Logistics Systems for Sustainable Cities*, 17–35.
- Browne, M., Sweet, M., Woodburn, A., & Allen, J. (2005). *Urban Freight Consolidation Centers Final Report*. London: University of Westminster.
- Buck Consultants International (2013). Nieuwsbrief (News Letter) Buck Consultants International. Februari 2013. Retrieved from <http://www.bciglobal-news.com/modules/archive.php?news=585>
- Chwieduk, D. (2003) Towards sustainable-energy buildings. *Applied Energy* 76: 211–217.
- City of Rotterdam (2019). *Roadmap ZECL: Moving towards Zero Emission City Logistics (ZECL) in Rotterdam in 2025*. Rotterdam: City of Rotterdam.
- <https://www.rotterdam.nl/wonen-leven/stappenplan-zero-emissie/Roadmap-ZECL.pdf>
- Corbin, J., & Morse, J. M. (2003). The Unstructured Interactive Interview: Issues of Reciprocity and Risks when Dealing with Sensitive Topics. *Qualitative Inquiry*, 9(3), 335–354.

- Dablanc, L. (2007). Goods transport in large European cities: Difficult to organize, difficult to modernize. *Transportation Research Part A: Policy and Practice*, 41(3), 280-285.
- Dablanc, L., Ogilvie, S., & Goodchild, A. (2014). Logistics sprawl: differential warehousing development patterns in Los Angeles, California, and Seattle, Washington. *Transportation Research Record*, 2410(1), 105-112.
- Duin, J. H. R., Dam, T., Wiegman, B., & Tavasszy, L. A. (2016). Understanding Financial Viability of Urban Consolidation Centres: Regent Street (London), Bristol/Bath & Nijmegen. *Transportation Research Procedia*, 16, 61–80.
- Dye, T. R. (1972). *Understanding Public Policy*. Englewood Cliffs, NJ: Prentice-Hall.
- Entrop, A. G., & Brouwers, H. J. H. (2010). Assessing the sustainability of buildings using a framework of triad approaches. *Journal of Building Appraisal*, 5(4), 293–310.
- European Commission (2011). Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, White Paper, European Commission. <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144>
- European Commission (2013). Special Eurobarometer, 2013, attitudes of Europeans towards urban mobility. Brussels.
- Faugere, L., & Montreuil, B. (2017). Hyperconnected pickup & delivery locker networks. In *Proceedings of the 4th International Physical Internet Conference*.
- Flick, U. (2002). *An Introduction to Qualitative Research*. Thousand Oaks: Sage Publications Inc.
- Gevaers, R., van de Voorde, E., & Vanelander, T. (2011). Characteristics and typology of last-mile logistics from an innovation perspective in an urban context. *City Distribution and Urban Freight Transport: Multiple Perspectives*. Edward Elgar Publishing, 56-71.
- Graham, L., Hall, R., & Troni, E. (2019). *The Changing Face of Distribution: The Shape of Things to Come*. London: Cushman & Wakefield.
- Grebe, S., Hilster, D., Hoen, A., Király, J., Leestemaker, L, Tol, E. & de Jonge, V. (2021). *Effectbepaling duurzame mobiliteitsopties: Provincies Noord-Holland en Flevoland*. Delft: CE Delft.
- Groen, M., Vos, G., Verweij, K., Otten, M., Tol, E., Wagter, H., de Goffau, W., Nering Bogel, W., School, R., Ploos van Amstel, W., Balm, S., van den Hoed, R., van den Engel, A., Kindt, M., Kin, B., Nesterova, N. & Quak, H. (2019). *Laadinfrastructuur voor elektrische voertuigen in stadslogistiek*. Delft: Connekt.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, 2(163-194), 105.
- Gubrium, J.F., & Holstein, J.A. (Eds.). (2001). *The Handbook of Interview Research*. London: SAGE.
- Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. In *Forum: Qualitative Social Research* (Vol. 18, No. 1).
- Hart, H. 't, van Dijk, J., de Goede, M., Jansen, W., & Teunissen, J. (1998). *Onderzoeksmethoden*. Amsterdam: Boom

- Hawkesworth, M. (1992). 'Epistemology and Policy Analysis'. In W. Dunn & R.M. Kelly (eds), *Advances in Policy Studies*. New Brunswick: Transaction, 291–329.
- Hesse, M., & Rodrigue, J.-P. (2004). The transport geography of logistics and freight distribution. *Journal of Transport Geography*, 12(3), 171–184.
- Hestnes, A.G. (2001) The New Solar Buildings. In: K. van der Leun and B. van der Ree (eds.), *Proceedings of the 9th International Conference on Solar Energy in High Latitudes*; 6–8 May, Leiden: Ecofys.
- Hill, M. & P. L. Hupe. (2006). 'Analysing Policy Processes as Multiple Governance: Accountability in Social Policy'. *Policy and Politics* 34, no. 3: 557–73.
- Hood, C. (1986). *The Tools of Government*. Chatham: Chatham House.
- Hood, C. & Margetts, H.Z. (2007). *The Tools of Government in the Digital Age*. Basingstoke: Palgrave Macmillan.
- Howlett, M. (2009). Governance modes, policy regimes and operational plans: A multi-level nested model of policy instrument choice and policy design. *Policy Sciences*, 42(1), 73–89.
- Howlett, M. (2011). *Designing Public Policies: Principles and Instruments*. New York: Routledge.
- Howlett, M. (2019). *Designing public policies: Principles and instruments*. London: Routledge.
- Howlett, M. & Cashore, B. (2009). 'The Dependent Variable Problem in the Study of Policy Change: Understanding Policy Change as a Methodological Problem'. *Journal of Comparative Policy Analysis: Research and Practice* 11, no. 1: 33–46.
- Iwan, S. Ł., & Kijewska, K. (2014). The Integrated Approach to Adaptation of Good Practices in Urban Logistics based on the Szczecin Example. *Procedia - Social and Behavioral Sciences*, 125, 212–225. <https://doi.org/10.1016/j.sbspro.2014.01.1468>
- Janjevic, M., & Ndiaye, A. (2017). Investigating the financial viability of urban consolidation centre projects. *Research in Transportation Business & Management*, 24, 101–113. <https://doi.org/10.1016/j.rtbm.2017.05.001>
- Kennisinstituut voor Mobiliteitsbeleid (KiM) (2015). *Stedelijke bevoorrading*. <https://www.kimnet.nl/binaries/kimnet/documenten/notities/2017/06/06/stedelijke-bevoorrading/Stedelijke+bevoorrading.pdf>
- Kiba-Janiak, M. (2017). Urban freight transport in city strategic planning. *Research in Transportation Business & Management*, 24, 4–16. <https://doi.org/10.1016/j.rtbm.2017.05.003>
- Kin, B., Verlinde, S., & Macharis, C. (2017). Sustainable urban freight transport in megacities in emerging markets. *Sustainable cities and society*, 32, 31–41.
- Knill, C., & Tosun, J. (2020). *Public policy: a new introduction (Second)*. London: Macmillan Education.
- Kuo Y., Wang C.C., & Chuang P.Y. (2009). Optimizing goods assignment and the vehicle routing problem with time-dependent travel speeds. *Computer Industrial Engineering*, 57, 1385–1392.

- Lagorio, A., Pinto, R., & Golini, R. (2016). Research in urban logistics: a systematic literature review. *International Journal of Physical Distribution & Logistics Management*, 46(10), 908–931.
- Lasswell, H. (1956). *The Decision Process: Seven Categories of Functional Analysis*. College Park, MD: University of Maryland Press.
- Lasswell, H. (1958). *Politics: Who Gets What, When, How*. New York: Meridian.
- Li, Y., Lim, M. K., Tan, Y., Lee, S. Y., & Tseng, M. L. (2020). Sharing economy to improve routing for urban logistics distribution using electric vehicles. *Resources, Conservation and Recycling*, 153, 104585.
- Liedtke, G. (2009). Principles of micro-behavior commodity transport modeling. *Transportation Research Part E: Logistics and Transportation Review*, 45(5), 795-809.
- Lindholm, M., & Browne, M. (2013). Local Authority Cooperation with Urban Freight Stakeholders: A Comparison of Partnership Approaches. *European Journal of Transport and Infrastructure Research*, 13(1), 20-38.
- Lysen, E. (1996) The Trias Energica: Solar Energy Strategies for Developing Countries. In: A. Goetzberger and J. Luther (eds.). Proceedings of the EUROSUN Conference; 16–19 September, Freiburg, Germany: DGS Sonnenenergie Verlags-GmbH.
- Marcucci, E., & Danielis, R. (2008). The potential demand for an urban freight consolidation centre. *Transportation*, 35(2), 269-284.
- Marin, M. A. F. V. (2020). Towards a more Hyperconnected, Smart, and Sustainable Urban Logistics: Development and Applications of Urban Logistics Platforms 4.0. *2020 IEEE 13th International Colloquium of Logistics and Supply Chain Management (LOGISTIQUA)*. Published.
- Mayntz, R. (1979). Public Bureaucracies and Policy Implementation. *International Social Science Journal*, 31(4): 633– 645.
- Melo, S., & Baptista, P. (2017). Evaluating the impacts of using cargo cycles on urban logistics: integrating traffic, environmental and operational boundaries. *European transport research review*, 9(2), 30.
- Meuleman, L. (2011). Chapter five metagoverning governance styles—broadening the public manager’s action perspective. *Interactive policy making, metagovernance, and democracy*, 95, 95-104.
- Miles, M.B., & Huberman, A.M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks: Sage Publishing Inc.
- Mintrom, M. (2007). ‘The Policy Analysis Movement’. In, D., M. Howlett & D. Laycock (eds), *Policy Analysis in Canada: The State of the Art*. Toronto: University of Toronto Press, 71–84.
- Moses, J., & Knutsen, T. (2012). *Ways of Knowing (2de ed.)*. Palgrave Macmillan.
- Musolino, G., Rindone, C., Polimeni, A., & Vitetta, A. (2019). Planning urban distribution center location with variable restocking demand scenarios: General methodology and testing in a medium-size town. *Transport Policy*, 80, 157–166.

- Nefs, M., & Soret, L. (2020). Logistiek en de stad met elkaar verbinden: zo doen ze dat in Parijs. *Gebiedsontwikkeling*. <https://www.gebiedsontwikkeling.nu/artikelen/logistiek-en-de-stad-met-elkaar-verbinden-zo-doen-ze-dat-parijs/>
- Newman, P., & Kenworthy, J. (1999). *Sustainability and Cities: Overcoming Automobile Dependence*. Washington: Island Press.
- Nordtømme, M. E., Bjerkan, K. Y., & Sund, A. B. (2015). Barriers to urban freight policy implementation: The case of urban consolidation center in Oslo. *Transport Policy*, 44, 179–186.
- Omgevingsagenda*. (n.d.). Nationale Omgevingsvisie. Consulted on Augustus 28, 2021, from <https://www.denationaleomgevingsvisie.nl/samenwerking+en+uitvoering/omgevingsagenda/default.aspx>
- Quak, H.J. (2008, March 20). *Sustainability of Urban Freight Transport: Retail Distribution and Local Regulations in Cities* (No. EPS-2008-124-LIS). ERIM Ph.D. Series Research in Management. Erasmus Research Institute of Management.
- Quak, H., & Nesterova, N. (2014). *Towards zero emission urban logistics: Challenges and issues for implementation of electric freight vehicles in city logistics*. Bingley: Emerald Group Publishing Limited.
- Quak, H., Nesterova, N., van Rooijen, T., & Dong, Y. (2016). Zero Emission City Logistics: Current Practices in Freight Electromobility and Feasibility in the Near Future. *Transportation Research Procedia*, 14, 1506–1515.
- Quak, H., van Duin, R., & Hendriks, B. (2020). Running an urban consolidation centre: Binnenstadservice 10 years back and forth. *Transportation Research Procedia*, 46, 45–52.
- Raad voor de Leefomgeving en Infrastructuur (Rli). (2013). *Nederlandse Logistiek 2040: Designed to Last*.
- Ranieri, L., Digiesi, S., Roccotelli, M., & Silvestri, B. (2018). A review of last mile logistics innovations in an externalities cost reduction vision. *Sustainability*, 10(3), 782.
- Roorda, M. J., Cavalcante, R., McCabe, S., & Kwan, H. (2010). A conceptual framework for agent-based modelling of logistics services. *Transportation Research Part E: Logistics and Transportation Review*, 46(1), 18-31.
- Russo, F., & Comi, A. (2012). City characteristics and urban goods movements: A way to environmental transportation system in a sustainable city. *Procedia-Social and Behavioral Sciences*, 39, 61-73.
- Russo, F., Musolino, G., & Trecozzi, M. R. (2013). A system of models for the assessment of an urban distribution center in a city logistic plan. *Urban Transport XIX*, 799–810.
- Sakai, T., Kawamura, K., & Hyodo, T. (2017). Spatial reorganization of urban logistics system and its impacts: Case of Tokyo. *Journal of Transport Geography*, 60, 110–118.
- Sanderson, I. (2002). 'Making Sense of What Works: Evidence Based Policymaking as Instrumental Rationality?' *Public Policy and Administration* 17, no. 3: 61–75.

- Savelsbergh, M., & Van Woensel, T. (2016). 50th Anniversary Invited Article—City Logistics: Challenges and Opportunities. *Transportation Science*, 50(2), 579–590.
- Schneider, A. L., & Ingram H. (1990). Behavioural assumptions of policy tools. *Journal of Politics*, 52(2), 511-529.
- Schramm, W. (1971). Notes on Case Studies of Instructional Media Projects.
- Siegfried, P., Michel, A., & Tänzler, J. (2021). Analyzing sustainability issues in urban logistics in the context of growth of e-commerce. *Journal of Social Sciences*, 4(1).
- Semanjski, I., & Gautama, S. (2019). A Collaborative Stakeholder Decision-Making Approach for Sustainable Urban Logistics. *Sustainability*, 11(1), 234.
- Tario, J.D., Ancar, R., Panero, M., Shin, H.S., & Lopez, D.P. (2011). *Urban Distribution Centers: A Means to Reducing Freight Vehicle Miles Traveled*. Albany, NY: New York State Energy Research.
- Thiel, S. van (2014). *Research methods in public administration and public management: An introduction*. Routledge.
- Timney Bailey, M. (1992). Do Physicists Use Case Studies? Thoughts on Public Administration Research. *Public Administration Review*, 52(1), 47–54.
- Vedung, E. (1998). Policy Instruments: Typologies and Theories. In: M.L. Bemelmans-Videc, R.C. Rist and E. Vedung (eds.), *Carrots, Sticks and Sermons*. New Brunswick: Transaction.
- Verlinde, S. (2015). *Promising but challenging urban freight transport solutions: freight flow consolidation and off-hour deliveries*. Ghent: Ghent University.
- Verschuren, P. & Doorewaard, H. (2015). *Het ontwerpen van een onderzoek*. Amsterdam: Boom Lemma.
- Walsh, J. I. (1994). 'Institutional Constraints and Domestic Choices: Economic Convergence and Exchange Rate Policy in France and Italy'. *Political Studies* 42, no. 2: 243–58.
- Witkowski, J. Ł., & Kiba-Janiak, M. (2014). The Role of Local Governments in the Development of City Logistics. *Procedia - Social and Behavioral Sciences*, 125, 373–385.
- Wu, X., M. Ramesh, M. Howlett & S. Fritzen. (2010). *The Public Policy Primer: Managing Public Policy*. London: Routledge.
- Yin, R. (2003). *Case study research: design and methods*. SAGE: London.
- ZES partners. (z.d.). Op weg naar ZES. Consulted on August 28, 2021, from <https://opwegnaarzes.nl/over-zes/partners>
- Zhang, L., Long, R., & Chen, H. (2019). Carbon emission reduction potential of urban rail transit in China based on electricity consumption structure. *Resources, Conservation and Recycling*, 142, 113-121.
- Zissis, D., Aktas, E., & Bourlakis, M. (2018). Collaboration in urban distribution of online grocery orders. *The International Journal of Logistics Management*, 29(4), 1196–1214.

Appendix A. Overview of the conducted interviews

#	Category	Name	Function respondent	Company connection to urban distribution	Sector
1	Company	Bidfood	Project leader sustainability	Testing with hub implementation	Food (conditioned) B2B
2	Company	Cycloon	Co-founder	Company with urban hub structure	Parcel / health / retail B2B + B2C
3	Company	Jumbo	Supply chain developer	Company with city-regional hub structure	Food (conditioned) B2C
4	Company	Lessgo	Co-founder	UCC	Retail / parcel B2B (+ B2C)
5	Company	MSG	Manager urban distribution	UCC	Parcel / facility B2B
6	Company	PostNL	Manager sustainability	Company with city-regional hub structure	Parcel B2C
7	Company	ReLAB	Hub developer	Real estate investor	Food / retail B2C (+ B2B)
8	Company	UTS Verkroost	Manager urban distribution	UCC	Facility / parcel / construction. B2B
9	Municipality	Amsterdam	Project leader distribution hubs		
10	Municipality	Den Haag	Policy officer projects		
11	Municipality	Enschede	4 policy advisors + Account manager		
12	Municipality	Gouda	Policy officer economy and space		
13	Municipality	Groningen	Policy officer urban development		
14	Municipality	Leiden, 1	Project manager sustainability		
15	Municipality	Leiden, 2	Urban planner		
16	Municipality	Maastricht	Project leader logistics		
17	Municipality	Nijmegen	Account manager companies + Program manager sustainable logistics		
18	Municipality	Tilburg	Policy officer economics		
19	Province	Overijssel	Program manager logistics		

Appendix B. Interview guide local governments

(Introductie)

Algemene procedures ten aanzien van opnamen, gespreksverslag naderhand sturen etc. Het onderwerp van mijn scriptie, en daarmee dit interview, is 'ruimte voor stedelijke distributie hubs [SDH's] in de stad'. Eerst behandelen we wat inleidende vragen, dan volgen wat vragen over de ZE-zone. Vervolgens zal ik dieper in gaan op de stadsdistributiehubs: wat is hun (potentiële) rol in de stad, wat is de ruimtevraag en wat is de eventuele rol van de gemeente daarbij. Tot slot ben ik benieuwd hoe de potentiële ruimte voor hubs zich verhoudt tot andere functies.

- Wat is uw functie bij de gemeente?
- In hoeverre bent u bekend met SDH's?
- Hoe komt u via uw rol/functie bij de gemeente in aanraking met SDH's?
- In hoeverre spelen SDH's een rol in uw gemeente?

(ZE-Zone)

Uw gemeente voert in 2025 een Zero Emission Zone in in de binnenstad.

- Hoe hoog staat Zero Emissie op de gemeentelijke agenda?
 - o Ten opzichte van andere zaken
 - o In vergelijking met mobiliteit en duurzaamheid
- Welke rol ziet de gemeente voor zichzelf in het hele proces richting Zero Emissie? (bv. ze zijn een aantrekker in het proces, ze hadden liever gezien dat het pas later zou worden ingevoerd etc.)
- Hoe ver zijn jullie al met de plannen voor het implementeren van de zone?
- In hoeverre komt de ZE Zone overeen met het huidige winkelenstertijdengebied?
- Wat zijn de beoogde effecten van de ZE Zone?
- Zijn er functies die als het ware 'uit de binnenstad gedrukt' worden door de invoering van de Zone? Hoe wordt hiermee omgegaan?
- Hoe verwachten jullie dat het invoeren van de zone de bevoorrading van ondernemers gaat beïnvloeden?

(Rol van SDH's)

Er zijn verschillende soorten SDH's. Naast eerder besproken multi-user hubs zijn er ook de *dedicated hubs*. Dedicated hubs vallen in de logistieke keten van één bedrijf, bijvoorbeeld de hubs van Albert Heijn, Picnic of PostNL. In multi-user hubs worden goederen van verschillende bedrijven gebundeld en verder getransporteerd.

- Wat voor rol denkt u dat deze beide types SDH's kunnen spelen in stadsdistributie?
- Wat voor effect denkt u dat een SDH kan hebben op de stad? (bv. minder uitstoot, werkgelegenheid, meer onvrede bij ondernemers)
 - o Positieve én negatieve effecten
- Welke rol ziet de gemeente voor zichzelf in het faciliteren van SDH's?
 - o 'Facilitatieladder':
 - Zelf een SDH opzetten
 - Financieel ondersteunen
 - Overheid als inkoper/aanbesteder (startvolume creëren)
 - Locatie(s) aanwijzen voor SDH's
 - Meewerken met bestemmingsplanwijzigingen, indien nodig
 - Netwerker: geïnteresseerde partijen samenbrengen
 - Geen rol: alles aan de markt laten
- Maakt de plek op de 'facilitatieladder' nog uit per type hub?

(Ruimte voor SDH's)

In hoeverre zijn er de laatste tijd initiatieven voor SDH's langsgekomen bij uw gemeente? (bv. een ondernemer die een hub wil vestigen en op zoek is naar een kavel/pand)

- Wat houden die initiatieven in?
 - Wat vragen ze precies van de gemeente?
- Wat is de reactie van de gemeente op zo'n initiatief?
 - Is er een bepaalde procedure als er een initiatief wordt ingediend?
 - Hoe ziet die procedure er uit?
- Wat zijn redenen om wel/niet (actief) mee te werken bij een SDH-initiatief?
- Zijn er partijen die naar de gemeente toe komen met een netwerkvraag? Bijvoorbeeld "kennen jullie partijen die geïnteresseerd zijn in SDH's?"
 - Ja: Wat is de reactie hierop?
 - Nee: Zouden jullie de netwerkrol op jullie willen nemen?
- Indien er een specifieke locatie is voor initiatieven:
 - Zijn er ook andere initiatieven die zich voor dezelfde of soortgelijke kavels/panden melden?
 - In hoeverre heeft de gemeente zelf plannen met de kavels/panden waar een SDH-initiatief voor is?
- Zijn er in de gemeente alternatieve kavels/panden voorhanden waar een SDH's ook heen zouden kunnen?
- In hoeverre is er ruimtegebrek voor initiatieven zoals de SDH's?
 - Voor verschillende locaties: bedrijventerreinen, rand van het centrum
- Hoe bepaalt de gemeente welk initiatief of plan daadwerkelijk uitgevoerd wordt?
- Als er meerdere ruimteclaims zijn, krijgt een plan van de gemeente dan voorrang?
- Hoe worden de positieve en negatieve effecten van verschillende ruimteclaims vergeleken?
- Wat is de (huidige) urgentie van SDH's ten opzichte van andere functies?
- In hoeverre denkt u dat het invoeren van een Zero Emission Zone bijdraagt aan de urgentie of voorrang van SDH's?
- Hoe ziet u het verband tussen een ZE Zone en de stadsdistributie? Is een ZE Zone nodig om stadsdistributie duurzaam te krijgen of is een ZE Zone een logisch gevolg van de ontwikkelingen rondom stadsdistributie?

Appendix C. Interview guide dedicated urban distribution hub users

(Introductie)

Algemene procedures ten aanzien van opnemen, gespreksverslag naderhand sturen etc. Het onderwerp van mijn scriptie, en daarmee dit interview, is 'ruimte voor stedelijke distributie hubs [SDH's] in de stad'. Eerst zullen we wat inleidende vragen behandelen, vervolgens zullen we ingaan op de huidige bedrijfsvoering en de eigenschappen van de hub. Vervolgens zullen we het proces van het opstarten van een hub bespreken, om tot slot te kijken naar de mogelijkheden voor functiemenging en duurzaamheid.

- Wat is uw functie binnen het bedrijf?
- Hoe lang werkt u al bij het bedrijf?

(Huidige bedrijfsvoering)

- Wanneer is deze hub opgericht?
- Is het pand huur/koop? Wie is de eigenaar?
- Welk type goederen loopt via jullie hub?
 - o Retail
 - o Bouwlogistiek
 - o Pakketjes
 - o Facility
 - o Supermarkt
 - o Eten / Horeca
- Staan goederen hier lang opgeslagen of is het meer een *cross-docking station*?
- Waarom lopen deze goederen via jullie hub (en niet rechtstreeks)?
- Wat is het verzorgingsgebied van deze hub?
- Wat is de voornaamste locatie van het eindpunt (de winkel/de ondernemer)?
 - o Binnenstad? Elders in de stad? Veel verschillende steden?
- Wat zijn jullie groeiverwachtingen? Qua aantal klanten en qua volume
 - o Tot 2025, 2030 en erna

(Eigenschappen hub)

- Was dit pand een bestaand pand of is het nieuw gebouwd?
 - o Waarom is er gekozen voor nieuw / bestaand?
- Was het lastig om een geschikte locatie / geschikt pand te vinden?
- Waren er andere opties beschikbaar als vestigingsoptie (kavels / panden)?
 - o Waarom is er toch voor deze optie gekozen?
 - o In hoeverre heeft de prijs een rol gespeeld?
- Is er op de volgende punten gelet bij het ontwerpen/betrekken van het pand?
 - o Pandgrootte
 - o Kavelgrootte
 - o Hoeveelheid buitenruimte
 - o Aantal laaddocks / overslagopties
 - o Aantal verdiepingen / bouwhoogte
 - o Uitbreidingsmogelijkheden
 - o Afstand tov de snelweg
 - o Afstand tov afleveradres
 - o Ligging tov ZE zone
 - o Watergebonden locatie
 - o (Huur)prijs
 - o Netaansluiting (voor elektrische auto's)
 - o Duurzaamheid
 - o Andere functies (nu of in de toekomst)
 - o Diensten in de buurt (garage)
 - o Concullega's
- Wat is de mate van urgentie van bovenstaande factoren bij het ontwerpen/betrekken van een pand?
- In hoeverre is een bestaand pand een pré? Of juist liever zelf ontwerpen?
 - o Wat maakt het één of het ander prettiger?
- In hoeverre zijn er in het ontwerp- of vestigingsproces keuzes gemaakt die achteraf minder handig blijken in de praktijk?
 - o Zijn er factoren waar meer/minder rekening gehouden had hoeven worden?
- **Als er nu een nieuw pand betrokken zou kunnen worden, wat zou er dan het belangrijkste zijn aan het nieuwe pand?**

(ZE Zone)

- In hoeverre zou de invoering van de ZE zone een rol spelen in de locatie van het nieuwe pand?
 - Hub in de zone? Net er buiten? Ver er buiten?
- Wat is jullie mening over de invoering van de ZE zone?
- In hoeverre is het invoeren van een ZE Zone in de binnenstad van invloed op:
 - De locatie van de hub tov uitvalswegen
 - De locatie tov afleveradressen / klanten
 - De bedrijfsvoering
 - Duurzaamheidsambities
 - Het goederenvolume dat door de hub gaat

(Procedures)

- Zijn jullie bij de gemeente langs gegaan voor hulp voor een geschikte locatie?
- In hoeverre heeft een overheidspartij een rol gespeeld bij het opstarten van deze hub?
 - Financieel ondersteunen
 - Geholpen met het zoeken van een locatie
 - Geholpen met procedures zoals een bestemmingsplanwijziging
- Hadden jullie meer hulp kunnen gebruiken vanuit de gemeente?
- Wat waren de lastige onderdeel van het opstarten van een hub?
 - Bv. bestemmingsplan moest gewijzigd worden, locatie vinden.

(Functiemenging)

- Wordt dit pand uitsluitend gebruikt als SDH? Zo nee, wat dan nog meer?
 - o Valt dat goed te combineren?
- In hoeverre is het mogelijk dat een hub boven een andere functie gevestigd is?
- In hoeverre is het mogelijk dat de hub zelf meerdere verdiepingen heeft?
- Is er bij het betrekken van het pand ook gekeken naar het mogelijk kunnen combineren van functies? Buiten het eigen bedrijf om
- In hoeverre had dat het vinden van een pand kunnen vergemakkelijken?
- Welke functies zouden zich prima kunnen lenen voor een mogelijke combinatie? En welke functies minder goed?
 - o Bv. beperkend door geluidsoverlast van vrachtwagens van/naar de hub
 - o Mogelijkheden door combineren van functies met verschillende 'openingstijden'

(Duurzaamheid)

- In hoeverre heeft duurzaamheid een rol gespeeld bij de opzet van de hub?
 - o Isolatie
 - o Groene daken / zonnepanelen
 - o Hergebruik van bestaande materialen (of bestaand pand)
- In hoeverre speelt duurzaamheid een rol bij de huidige bedrijfsvoering?
 - o Gebruik ZE-voertuigen
 - o Gebruik groene stroom
- In hoeverre hebben kosten en opbrengsten een rol gespeeld in duurzaamheids-overwegingen? (bv goede isolatie = minder stookkosten)
- Kan de hub gemakkelijk worden aangepast bij toekomstige groei?
 - o Bv. demonteerbare wanden
 - o Zo nee, wat te doen als de hub te klein wordt?
 - o Is dit iets om rekening mee te houden bij het betrekken van een pand?
- In hoeverre zou duurzaamheid een rol spelen als er nu een nieuw pand zou worden betrokken?

Appendix D. Interview guide UCC users

(Introductie)

Algemene procedures ten aanzien van opnemen, gespreksverslag naderhand sturen etc. Het onderwerp van mijn scriptie, en daarmee dit interview, is 'ruimte voor stedelijke distributie hubs [SDH's] in de stad'. Eerst zullen we wat inleidende vragen behandelen, vervolgens zullen we ingaan op de huidige bedrijfsvoering en de eigenschappen van de hub. Vervolgens zullen we het proces van het opstarten van een hub bespreken, om tot slot te kijken naar de mogelijkheden voor functiemenging en duurzaamheid.

- Wat is uw functie binnen het bedrijf?
- Hoe lang werkt u al bij het bedrijf?

(Huidige bedrijfsvoering)

- Wanneer is deze hub opgericht?
- Is het pand huur/koop? Wie is de eigenaar?
- Is er een bepaald type goed/sector dat via jullie hub loopt? Of gemixt?
 - o Retail
 - o Bouwlogistiek
 - o Pakketjes
 - o Facility
 - o Supermarkt
 - o Eten / Horeca
- Staan goederen hier lang opgeslagen of is het meer een *cross-docking station*?
- Waarom lopen deze goederen via jullie hub (en niet rechtstreeks)?
- Wie is jullie klant binnen de goederenketen? De leverancier, de winkel/het eindpunt?
- Wat is het verzorgingsgebied van deze hub?
- Wat is de voornaamste locatie van het eindpunt (de winkel/de ondernemer)?
 - o Binnenstad? Elders in de stad? Veel verschillende steden?
- Wat zijn jullie groeiverwachtingen? Qua aantal klanten en qua volume
 - o Tot 2025, 2030 en erna

(Eigenschappen hub)

- Was dit pand een bestaand pand of is het nieuw gebouwd?
 - o Waarom is er gekozen voor nieuw / bestaand?
- Was het lastig om een geschikte locatie / geschikt pand te vinden?
- Waren er andere opties beschikbaar als vestigingsoptie (kavels / panden)?
 - o Waarom is er toch voor deze optie gekozen?
 - o In hoeverre heeft de prijs een rol gespeeld?
- Is er op de volgende punten gelet bij het ontwerpen/betrekken van het pand?
 - o Pandgrootte
 - o Kavelgrootte
 - o Hoeveelheid buitenruimte
 - o Aantal laaddocks / overslagopties
 - o Aantal verdiepingen / bouwhoogte
 - o Uitbreidingsmogelijkheden
 - o Afstand tov de snelweg
 - o Afstand tov afleveradres
 - o Ligging tov ZE zone
 - o Watergebonden locatie
 - o (Huur)prijs
 - o Netaansluiting (voor elektrische auto's)
 - o Duurzaamheid
 - o Andere functies (nu of in de toekomst)
 - o Diensten in de buurt (garage)
 - o Concullega's
- Wat is de mate van urgentie van bovenstaande factoren bij het ontwerpen/ betrekken van een pand?
- In hoeverre is een bestaand pand een pré? Of juist liever zelf ontwerpen?
 - o Wat maakt het één of het ander prettiger?
- In hoeverre zijn er in het ontwerp- of vestigingsproces keuzes gemaakt die achteraf minder handig blijken in de praktijk?
 - o Zijn er factoren waar meer/minder rekening gehouden had hoeven worden?
- **Als er nu een nieuw pand betrokken zou kunnen worden, wat zou er dan het belangrijkste zijn aan het nieuwe pand?**

(ZE Zone)

- In hoeverre zou de invoering van de ZE zone een rol spelen in de locatie van het nieuwe pand?
 - Hub in de zone? Net er buiten? Ver er buiten?
- Wat is jullie mening over de invoering van de ZE zone?
- In hoeverre is het invoeren van een ZE Zone in de binnenstad van invloed op:
 - De locatie van de hub tov uitvalswegen
 - De locatie tov afleveradressen / klanten
 - De bedrijfsvoering
 - Duurzaamheidsambities
 - Het aantal klanten
 - Het goederenvolume dat door de hub gaat

(Procedures)

- Zijn jullie bij de gemeente langs gegaan voor hulp voor een geschikte locatie?
- In hoeverre heeft een overheidspartij een rol gespeeld bij het opstarten van deze hub?
 - Financieel ondersteunen
 - Overheid als inkoper / aanbesteder
 - Geholpen met het zoeken van een locatie
 - Geholpen met procedures zoals een bestemmingsplanwijziging
 - Overheid als netwerker: klantenwerving
- Hadden jullie meer hulp kunnen gebruiken vanuit de gemeente?
- Wat waren de lastige onderdeel van het opstarten van een hub?
 - Bv. bestemmingsplan moest gewijzigd worden, locatie vinden.

(Functiemenging)

- Wordt dit pand uitsluitend gebruikt als SDH? Zo nee, wat dan nog meer?
 - o Valt dat goed te combineren?
- In hoeverre is het mogelijk dat een hub boven een andere functie gevestigd is?
- In hoeverre is het mogelijk dat de hub zelf meerdere verdiepingen heeft?
- Is er bij het betrekken van het pand ook gekeken naar het mogelijk kunnen combineren van functies? Buiten het eigen bedrijf om
- In hoeverre had dat het vinden van een pand kunnen vergemakkelijken?
- Welke functies zouden zich prima kunnen lenen voor een mogelijke combinatie? En welke functies minder goed?
 - o Bv. beperkend door geluidsoverlast van vrachtwagens van/naar de hub
 - o Mogelijkheden door combineren van functies met verschillende 'openingstijden'

(Duurzaamheid)

- In hoeverre heeft duurzaamheid een rol gespeeld bij de opzet van de hub?
 - o Isolatie
 - o Groene daken / zonnepanelen
 - o Hergebruik van bestaande materialen (of bestaand pand)
- In hoeverre speelt duurzaamheid een rol bij de huidige bedrijfsvoering?
 - o Gebruik ZE-voertuigen
 - o Gebruik groene stroom
- In hoeverre hebben kosten en opbrengsten een rol gespeeld in duurzaamheids-overwegingen? (bv goede isolatie = minder stookkosten)
- Kan de hub gemakkelijk worden aangepast bij toekomstige groei?
 - o Bv. demonteerbare wanden
 - o Zo nee, wat te doen als de hub te klein wordt?
 - o Is dit iets om rekening mee te houden bij het betrekken van een pand?
- In hoeverre zou duurzaamheid een rol spelen als er nu een nieuw pand zou worden betrokken?

Appendix E. Overview of vehicle reduction measures

