Usability of Physical Internet characteristics for achieving more sustainable urban freight logistics

barriers and opportunities revealed by dominant stakeholder perspectives

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USABILITY OF PHYSICAL INTERNET CHARACTERISTICS FOR ACHIEVING MORE SUSTAINABLE URBAN FREIGHT LOGISTICS - BARRIERS AND OPPORTUNITIES REVEALED BY DOMINANT STAKEHOLDER PERSPECTIVES

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by

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1 INTRODUCTION

1.1 BACKGROUND

The current logistical system is described as unsustainable in an economical, environmental and social way (Montreuil, 2011). Mervis (2014) states that the logistical industry is a conservative industry that, because of this attitude, is now dealing with problems like the ones stated by Montreuil (2011). Also in urban areas the current logistical system is a major disturbing factor (OECD, 2003). This is a long occurring issue that was already researched by Binsbergen and Visser (2001) 20 years ago. Since urbanization is a prevailing global trend (World Bank, 2018) this part of logistics becomes increasingly important.

To address the unsustainabilities in urban freight logistics the Government of the Netherlands introduced the Green Deal Zero Emission City Logistics (ZECL) (Government of the Netherlands, 2018a). In this deal, originating from the climate agreement (Government of the Netherlands, 2018b), multiple municipalities and private bodies aim to eliminate emissions caused by urban freight logistics in 2025. The first Green Deal ZECL was agreed on in 2014. However, shortly after its start little action was undertaken. According to van Duin et al. (2016) this was due to the lack of a coherent plan, to fill that need a roadmap to ZECL was developed. More recently action was undertaken by municipalities, like Rotterdam, who constructed a roadmap towards ZECL for their own municipality (City of Rotterdam, 2019).

Besides stating the unsustainabilities in the current logistical system, Montreuil (2011) also introduces a promising concept to deal with the so called 'global logistics sustainability grand challenge'. This concept is called the 'Physical Internet (PI, π)', 'a global logistics system based on the interconnection of logistics networks by a standardized set of collaboration protocols, modular containers and smart interfaces for increased efficiency and sustainability' (Ballot et al., 2014). This 'open supply network' concept also appears as a strategy in the roadmap towards ZECL by van Duin et al. (2016) and in the Outlook City Logistics (Ploos van Amstel and Quak, 2017).

In other sectors the sharing economy is kick-started already and caused serious disruptions, also in the logistics sector this idea is coming up more often (Kückelhaus and Heutger, 2017). But still there are no parties that majorly disrupted the logistics market by, for example, providing a platform based on the sharing economy idea. However, there might be a 'risk' of this happening, together with the earlier mentioned urbanization and the global need to become more operate more sustainable a shift towards a more efficient system has urgency. Both for governmental organizations and the industry certain changes can cause a major impact.

To make the 'global logistics sustainability grand challenge' tangible Montreuil (2011) defines it by mentioning 13 unsustainability symptoms. One of these 13 symptoms addresses the high amount of empty travel and the associated problems in urban freight logistics. After that they are linked to PI characteristics that can have a positive impact on them like the increased connectivity that makes it easier to consolidate freight. Multiple characteristics of PI also promise to be useful in urban freight logistics and thus could help with achieving sustainability goals set in the Green Deal ZECL.

A literature review conducted in the PI domain by Sternberg and Norrman (2017) assessed the quantitative research done on the promised effects of PI implementation. A 20% reduction of fuel consumption

could be the case according to Ballot et al. (2012), research conducted by Pan et al. (2014) shows a possible CO2 reduction of 60% and Yang et al. (2017) concluded that logistics costs can be reduced to up to 73%. These are all promising results but it has to be said that return flows of PI-containers were not taken into account (Sternberg and Norrman, 2017).

There already are solutions in urban freight logistics to make it more sustainable but PI concepts are currently not in use. An Urban Consolidation Centre (UCC) is a current concept that is used that on some aspects relates to PI. It enables freight consolidation, from multiple origins, in an electronic vehicle (EV) by facilitating an 'open' asset in the form of a UCC. Theoretical models indicated that this concept could be successful but in reality only 7,5% of the UCC's are still in operation after 5 years (van Duin et al., 2012).

There is no direct relation between those UCC models and the PI models but it shows that modelling does not always proves to be right in logistics. There are a lot of external factors that can influence the results of the model like governmental regulations and stakeholder preferences. The literature review of Treiblmaier et al. (2016) in the PI domain shows that the majority of research conducted is quantitative or conceptual and only a small amount is based on surveys (7%) and case studies (3%).

Consequently, little is known about stakeholder perspectives regarding PI in urban freight logistics. But it is an important aspect since the PI will change the way decisions are made in the system which has a direct effect on the stakeholders (Ciprés and de la Cruz, 2019). Due to this literature gap it is not clear if stakeholders in urban freight logistics find a logistics system with PI implementation equally promising (Sternberg and Norrman, 2017).

Ciprés and de la Cruz (2019) also state that the governments can have an important role in the implementation of PI as a neutral body, Mervis (2014) agrees on this since the logistics industry is heavily regulated already. Ballantyne et al. (2013) stresses the need for 'greater interaction between local activities and freight transport stakeholders with regards to urban freight issues'. This is why this research will be carried out from a governmental viewpoint.

1.2 RESEARCH QUESTIONS

The national government and the local governments are both concerned with the unsustainability symptoms of current urban freight logistics and try to improve this (Government of the Netherlands, 2018b). As discussed in section 1.1 the implementation of solutions based on PI characteristics could be an interesting strategy to make urban freight logistics more sustainable. In the literature this is mainly indicated by results of conceptual and quantitative research but in a lesser extent by qualitative methods like surveys or interviews. Due to this there is a lack of knowledge regarding stakeholder perspectives on PI implementation. Since, urban freight logistics is characterized by a multitude of stakeholders, both public and private, this is an important aspect. This results in the following main research questions for this thesis.

- What opportunities and barriers are there for the implementation of Physical Internet characteristics in urban freight logistics?
- How can barriers and opportunities be used to move to more sustainable urban freight logistics?

To answer these questions it is necessary to know what the current characteristics of Dutch urban freight distribution are and how these are going to change after implementation of PI. That also introduces the need to know how PI can be implemented in urban freight logistics. To get more insight in the stakeholder perspectives on these changes the important stakeholders need to be identified first. All these topics are captured in the sub-research questions and help to answer the main research question.

1. What are the current characteristics of Dutch urban freight logistics?
2. What characteristics of the Physical Internet can be useful in Dutch urban freight logistics?
3. How does the Physical Internet change the characteristics of current Dutch urban freight logistics?
4. Who are the important stakeholders in Dutch urban freight logistics?
5. What are dominant public and private stakeholder perspectives regarding the implementation of Physical Internet inspired solutions in Dutch urban freight logistics?

2 ANALYSING URBAN FREIGHT LOGISTICS AND PHYSICAL INTERNET

In this chapter the two overarching themes of this report will be discussed, firstly, urban freight logistics and secondly the physical internet concept. In the end of the chapter the two themes are linked, this addresses the opportunities for the Physical Internet concept in an urban freight logistics context. At the end of this chapter a hypotheses for the research question is presented.

2.1 BACKGROUND: URBAN FREIGHT LOGISTICS

2.1.1 Defining urban freight logistics

Since this research addresses the implementation of Physical Internet characteristics in urban freight logistics it is also important to have a clear definition of the latter. In literature not only different definitions of the term are present, also multiple different titles for the term can be found. *Urban freight transport* is most commonly used (e.g. Visser and van Binsbergen (1999), Quak (2008), Ballantyne et al. (2013)), but also *urban freight distribution* (e.g. Marcucci and Gatta (2013)), *urban freight logistics* (e.g. Walker and Manson (2014)), *urban goods movement* (e.g. Ambrosini and Routhier (2004)) and *city logistics* (e.g. Quak and Tavasszy (2011), van Duin et al. (2016)) appear in literature. Urban freight *logistics* and urban freight *distribution* refer to the bigger picture in contrast to urban freight *transport*. *City logistics* is also a term that covers that load but this term also refers to a self-contained concept which could cause confusion (Crainic and Montreuil, 2016). Since this report focuses on the earlier mentioned 'bigger picture' urban freight *logistics* and urban freight *distribution* can be used, it is chosen to use urban freight *logistics*.

The term most of the times consists of three different parts referring to:

1. the geography; urban or city
2. the subject; freight or goods
3. the type of action; logistics, distribution, transport or movement

This shows that it is important to define the geography, what system the research is focused on and what kind of actions belong to that system. This also makes it possible to review definitions of different terms and use information from them.

The definition of Ogden (1992) is often quoted for urban freight transport: "the movement of things (as distinct from people) to, from, within, and through urban areas". Ambrosini and Routhier (2004) argues that this should also include "household purchasing trips" but in the overall consensus of this is not included (Dablanc, 2008). "The movement of things" can be executed by all the different modes that can be found in urban areas. But often some particular modes that are most abundant in the area are chosen to limit the research area (Ballantyne et al., 2013). The definition of Ogden (1992) is often adjusted to that specific research area.

Allen et al. (2000) used a definition that is 'broader than usual' namely: "(1) all types and sizes of goods vehicles and other motorised vehicles used for (core) goods collections and deliveries at premises in the urban area, (2) all types of goods vehicle movements to and from urban premises including

goods transfers between premises, ancillary goods deliveries to urban premises, money collections and deliveries, waste collections and home deliveries made from urban premises to customers, and (3) service vehicle trips and other vehicle trips for commercial purposes which are essential to the functioning of urban premises" (Allen et al., 2000). This proved to be useful in understanding the entire system and how this would be affected by certain policy changes.

In this research a more common and 'more narrow' definition is used that lies close to the definition OECD (2003) used: "the delivery of consumer goods (not only by retail, but also by other sectors such as manufacturing) in city and suburban areas, including the reverse flow of used goods in terms of clean waste". Binsbergen and Visser (2001) also states in the definition what kind of flows are included: "...;deals with the delivery of consumer goods to shops, department stores, supermarkets, the hospitality industry, offices and directly to the homes of customers." This is also the definition that is used in this report but including reverse flows consisting of consumer goods returns since this is an emerging flow.

Since the definition of Binsbergen and Visser (2001) is only slightly adjusted the criteria for goods flow that were defined in that research can also be used with minor adjustments printed in italics:

1. Type of goods: consumer goods
2. Place in the logistic chain: final distribution;
3. Situation: destination *and/or origin* within an urban area;
4. Objective: primary objective of the movement should be the *distribution* of goods.

Construction and waste logistics are both out of scope in this research. Besides that the focus will be on urban areas in the Netherlands. This does not mean that research conducted in urban areas in other countries will be left out since this can be very useful for the Dutch perspective as well.

2.1.2 Increased pressure on urban freight logistics and unsustainabilities

Some of the reasons behind unsustainable urban freight logistics are explained in section 1. This section will specifically aim on problems occurring in urban areas. Besides that, it is important to firstly state that urban freight logistics operations have a vital role in sustaining urban areas (Quak, 2008). Urban freight logistics is one of the key enablers of the urban lifestyle that becomes increasingly popular as indicated by the urbanization rate (World Bank, 2018). It also influences the competitiveness of an urban area and the logistics operations themselves also proves to be an important part of the urban economy (Anderson et al., 1999).

On the other hand urban logistics operations cause negative externalities like congestion, air pollution, noise disturbance and hazardous traffic situations (Quak and Tavasszy, 2011). The negative externalities can be distinguished by three overarching types of unsustainability issues (Quak, 2008). The overarching types are presented below together with their associated negative externalities.

'

- Environmental
  - Air pollution (climate change, biodiversity)
  - Waste production
- Social
  - Air pollution (air quality)
  - Congestion
  - Noise disturbance
  - Hazardous traffic situations
- Economical
  - Congestion
  - Inefficiency

' (Quak, 2008)

Montreuil (2011) states that 'Getting products in, through, and out of cities is a nightmare.' and that this is mainly caused due to the simple fact that cities are not designed for current volumes of freight transportation. Space is limited and it can be seen that the view on public space can change, there might be less room for motorized vehicles in urban areas of the future. When looking back in literature it can be identified that these problems already occur for a long time (Binsbergen and Visser, 2001).

With the ongoing urbanization (World Bank, 2018) these problems become even more evident in the future. Besides that a change in urban logistics can be noticed as well. An example of this is that due to the increasing popularity of e-commerce more direct B2C flows occur. These flows are characterized by small shipment sizes on a more frequent basis (Ploos van Amstel, 2017) (Marcucci et al., 2017). But this does not only apply to the B2C sector. It can be seen that this also occurs in the B2B sector since e-procurement became more popular as well (Taniguchi et al., 2016). This resulted in more Just-In-Time (JIT) logistics operations, also characterized by smaller shipments on a more frequent basis (figure 2.1). JIT inherently needs flexibility which makes the use of road transport more suitable in comparison to the other modalities (Quak, 2008).

These kind of JIT shipments do not necessarily have to cause more pressure on the urban freight logistics system if the total volume stays the same. But it can be noticed that a vast amount of B2B transport in urban freight logistics is executed by so-called own-account operators (Ploos van Amstel, 2017). Operations executed by own-account operators are often characterized by a low load factor and thus a low logistics efficiency, more on this can be found in section 2.1.4. Urban freight logistics already was characterized by a low efficiency and this development affected this in a negative way.

It can be concluded that the increased pressure on the urban freight logistics systems can be explained by multiple things. On the one hand main drivers, like urbanization and economic growth, cause a

higher transport demand. On the other hand new influences, like the rise of e-commerce (B2C) and e-procurement (B2B), cause smaller and more frequent shipments.

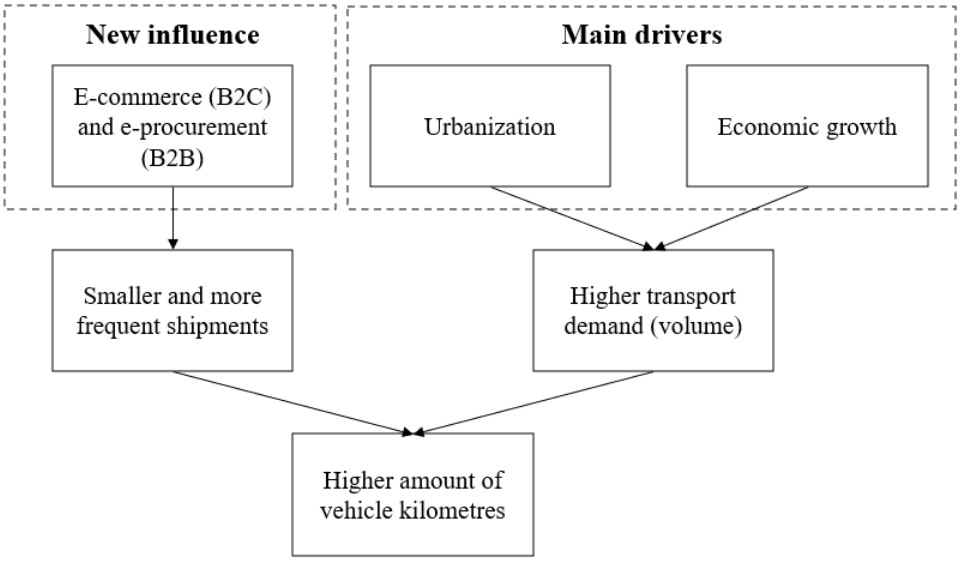

Figure 2.1: Long term drivers and new influences behind the increased pressure on urban freight logistics systems (van Son, 2020)

2.1.3 Dealing with the unsustainabilities, in practice

That the current urban freight logistics system is dealing with unsustainabilities does not mean that in the past decades nothing has been done to improve sustainability in urban freight logistics but Montreuil (2011) states that results are still modest. Logistics industry as a whole can be identified as a sector that is not very innovative compared to other sectors (Mervis, 2014). However, cities are increasingly aware of the problems related to urban freight logistics.

Also in Dutch urban freight logistics the theme is getting attention both from the industry and governmental organizations. On the industry side this already resulted in emerging companies that advocate sustainable urban freight logistics. But there are also established companies that change their operations to more sustainable ones. This is mainly accelerated by the Green Deal: ZECL that aims to make urban freight logistics emission free by 2025 in 30-40 municipalities (Government of the Netherlands, 2018a).

In the emerging companies that are specialized in urban freight logistics the use of zero emission vehicles is common, this can be electric lorries and vans, or cargo bikes. Another novelty is that some of those companies try to organize logistics in a smarter way, by trying to share both fixed and floating assets. Other companies do not own any physical assets but try to accelerate asset sharing in the industry by offering a platform. Besides that, the establishment of urban consolidation centres (UCC) and included urban transport is still happening in the industry. The UCC is still an idea that is seen as an important solution to the unsustainabilities in urban freight logistics.

As discussed in the introduction, an urban consolidation centre could indeed offer a solution for the unsustainabilities in city logistics. Just as can been seen with the PI concept the definition of the UCC concept can be ambiguous as well (Quak et al., 2020). In this report the definition provided by Quak et al. (2020) is used:

"A logistics facility situated in relatively close proximity to the geographic area that it serves (be that a city centre, an entire town or a specific site such as a shopping centre), to which many logistics companies deliver goods destined for the area, from which consolidated deliveries are carried out within that area, in which a range of other value added logistics an retails services can be provided."

It is important to mention that the consolidated deliveries are preferably carried out with zero emission vehicles. As Quak et al. (2020) describes, one aspect of the bright future for UCCs is that the concept enables zero emission logistics. Making urban freight logistics more sustainable and by that increase urban liveability is the main goal of UCC operations. However, the business model itself is not sustainable when it is not economically feasible, but this does seem to be a constraint instead of the main goal (Allen et al., 2012).

A UCC could theoretically offer cost savings in the supply chain (Quak, 2008). However, most of the UCC's can not sustain profitable operations and are obligated to close after some time (van Duin et al., 2012). Also other reports seem to draw the conclusion that it is hard to make a UCC economically feasible. Reasons for this are named by Expertgroep City Distribution (2019):

1. Fragmented cost savings for a multitude of parties
2. Savings start at a critical mass
3. Zero-emission (ZE) urban transport is not obligated (yet)

Following on this it is mentioned that close contact between the different parties is required to realize cost savings. It is expected that UCC's can become economically feasible when ZE zones are established in 2025 but then it should still be in a public-private partnership. (Expertgroep City Distribution, 2019)

The earlier mentioned Green Deal: ZECL aims to reduce emissions from urban freight logistics to zero by 2025 (Government of the Netherlands, 2018a). This should result in a change of the vehicles that are used and will directly help with mitigating one of the unsustainabilities, namely, CO_2 emissions.

Other unsustainabilities are not directly effected by this but might be effected indirectly. For example, if transport costs rise due to restrictions in vehicle use it might be an incentive to aim for more efficient transport. But when transport costs do not (!) rise, which is the goal of most projects, this will not happen. Due to the use of smaller electric vehicles this change may even results in more vehicle kilometers travelled than before (Topsector Logistiek, 2019) which could cause more problems in other dimensions as depicted in figure 2.2.

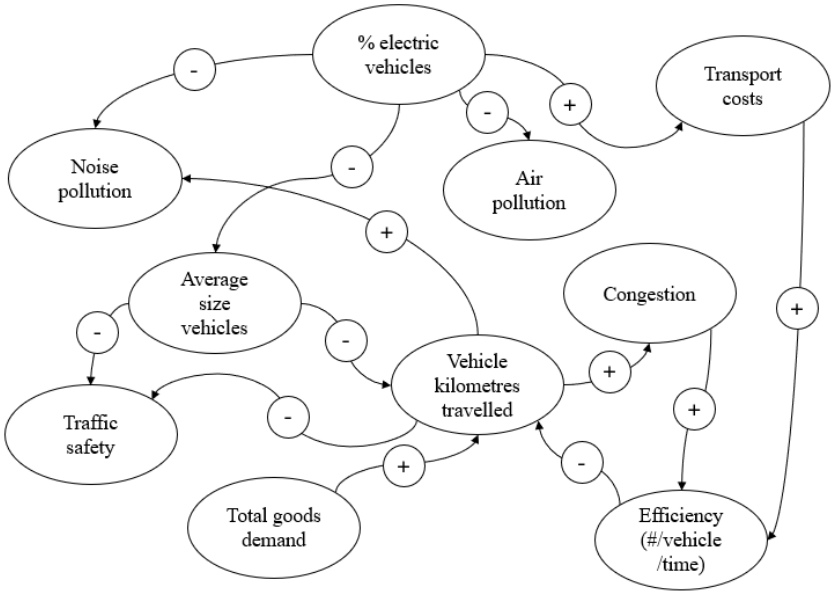

Figure 2.2: Example of system dynamics of electric fleet in urban freight logistics (van Son, 2020)

A lot of research done on urban freight logistics and the logistics sector as a whole states that efficiency is more important than just using other, cleaner, vehicles (e.g. Binsbergen and Visser (2001), Montreuil (2011), Crainic and Montreuil (2016)). More efficient operations should result in a smaller amount of vehicle kilometres. Those movements can then be carried out with cleaner vehicles or transport modes. This is also stated by Dutch local authorities that name efficiency as an important factor in their Green

Deal covenants (Gemeente Amsterdam, 2015) (Gemeente Delft, 2016) (Gemeente Den Haag, 2018) (City of Rotterdam, 2019) (Gemeente Utrecht, 2017).

The ZES policy originates from the climate agreement which has the ultimate goal of mitigating GHG-emissions (Government of the Netherlands, 2018b). However, more efficient logistics can be just as important because it has a positive effect on all the experienced negative externalities. Another example, besides the one explained in figure 2.2, is that changing to electric vehicles might also have a limited effect on the emissions of particulate matter (PM). Studies point out that significant amount of PM is emitted by the wear and tear of tyres (Emissions Analytics, 2020) (Jan Kole et al., 2017). This shows how the term ZECL can lead to misleading understanding of the effect on urban air quality.

Overall it can be said that both from governmental organizations and the industry action is undertaken to make urban freight logistics more sustainable. This is done with the focus on zero emission operations and with the focus on more efficient operations. It is important that efficiency is not forgotten since making current operations more efficient is the only way to (partly) mitigate all the mentioned externalities.

2.1.4 How stakeholders act in urban freight logistics

The high number of stakeholders is one of the factors that makes urban freight logistics inherently complex (Stathopoulos et al., 2012). Most of the times five different stakeholder groups are referred to, carriers (1), receivers (2), shippers (3), local authorities (4) and residents (5) (Quak and Tavasszy, 2011). These consist of the operational stakeholders, that are actually a part in the supply chain, and non-operational stakeholders that are context setters or subjects (Appendix E). In the first part of this section the operational stakeholders and their roles will be discussed and in the second part this will be done for the context setters and subjects.

Operational stakeholders

Getting freight in to and out of a city centre is a specific part of physical distribution with engagement of a multitude of diverse actors (Crainic and Montreuil, 2016). In the supply chain this urban move can be grouped with the *final distribution* that follows from *physical supply & materials management* as can be seen in figure 2.3. This research concerns urban freight logistics so the focus is on *final distribution* since the bulk of urban logistics mileage is related to this part (Binsbergen and Visser, 2001).

In figure 2.3 it can be seen that between all but one step a transport company or a logistics service provider (LSP) can participate to facilitate logistics and transport services. Since the emergence of online retail, and by that direct delivery to the customer, also between the retailer and consumer logistics service providers can participate in facilitating the last section of the supply chain (Visser et al., 2014) (figure 2.4).

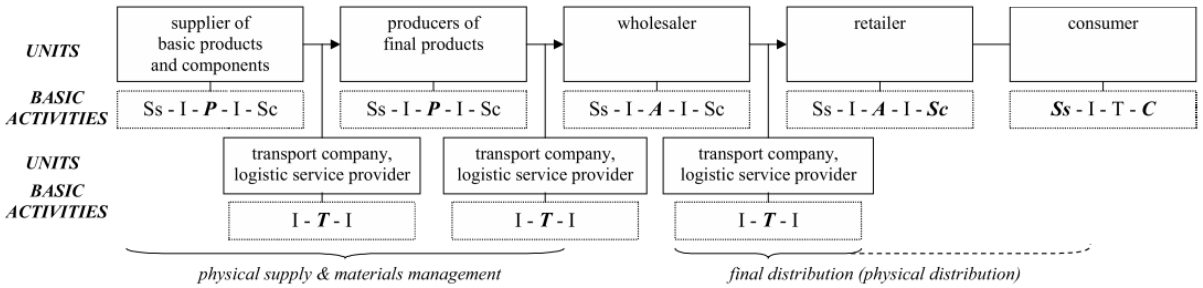

Figure 2.3: 'Materials management and physical distribution' (Binsbergen and Visser, 2001)

In figure 2.3 P stands for production, which is the main role for the producer at the start of the chain. Ss has to do with the search area for suppliers while Sc relates to the search area of clients. C is the consumption strategy which has to do with the demand side of the chain. Which can be influenced from the supplier by composing supply assortments (A). This can make it easier for the client to get a hold of the products but this can increase suppliers transport costs (T) (Binsbergen and Visser, 2001).

When looking at the *final distribution* it can be split up in business to consumer (B2C) and in business to business (B2B). In Amsterdam about 80% of city logistics mileage is related to B2B transport and only 20% is related to B2C transport. Besides that, the majority of these movements is not carried out by logistics service providers. This means that a lot of shippers and receivers take care of their own transport (Ploos van Amstel, 2017). Marcucci et al. (2017) calls this group of actors *own-account operators*, 'that instead of buying transport services from third parties self-organize/produce it'. A decreasing trend can be perceived in the share of transport performed by a logistics service provider in urban areas (Ploos van Amstel, 2017). This means that in the urban logistics there is a lot to win for the logistics service providers.

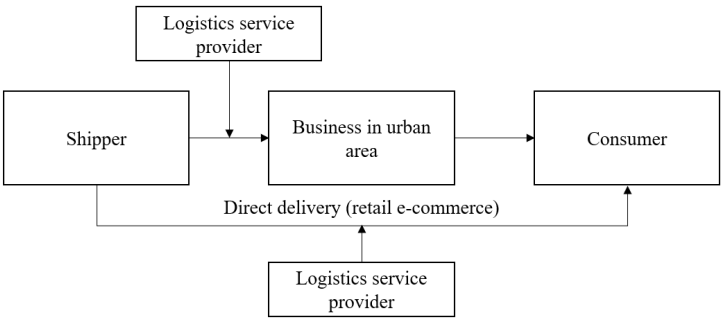

Figure 2.4: Adjusted final distribution chain including e-commerce (van Son, 2020)

In a more aggregate view urban freight logistics deals with three types of operational actors in the supply chain. These actor types are the shippers (1), logistics service providers (2) and the receivers (3) (Marcucci et al., 2017). In the chain the logistics service provider is optional since a shipper can also choose to self-organize its transport as discussed before, which currently happens in most of the cases. There are a lot of small businesses in the urban area that have a multitude of suppliers. This also results in a multitude of different businesses supplying the urban area. (Ploos van Amstel, 2017)

It is believed that operations of LSP's in urban logistics are fairly efficient already but, the direct shipments from the multitude of urban area suppliers are not (interview 3, appendix A). These shipments often done with polluting vehicles, a low load factor and perform a small amount of stops in the urban area. This co-causes a lot of the problems urban freight logistics currently has to deal with like congestion, safety issues, air pollution and noise disturbance.

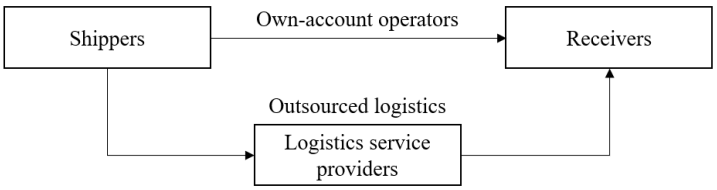

Figure 2.5: Own-account operators versus outsourced logistics (van Son, 2020)

The perceived in-efficiency in direct transport does also induce extra costs for the direct shipments. Theoretically, it could be more (cost) efficient to share resources and consolidate deliveries for the city center (Janjevic and Ndiaye, 2017). With this in mind it would be expected that LSP's serve the majority of that urban logistics market but as stated before, they do not. Receivers and shippers that self-organize their transport often choose for this because of a high service level (Stathopoulos et al., 2012) consisting of e.g. specific additional services, high flexibility, low-added costs, low-threshold and sales purposes. Assuming that transport costs could be lower with more efficient logistics provided by a third party (LSP) it also requires a competitive service level.

The abundance of own-account operators might be subject to change when zero emission transport is obligated. Transport services become less widely available by such an intervention because suitable vehicles might be scarce. This also means that transport costs can rise and by that it makes more sense to efficiently make use of asset sharing. On the other hand, if appropriate vehicles are available and affordable, it might only mean a shift to zero emission vehicles. Considering this, one of the issues is addressed but others, like congestion, still remain in place.

Non-operational stakeholders

The non-operational stakeholders consist of the local authorities and the residents. Both of them have a similar main interest, an accessible and liveable city (Quak and Tavasszy, 2011). However, they do not have the same powers. Residents can be influential but they do not have executive powers like local authorities have. This makes that residents can be identified as subjects and local authorities as context setters (Bryson, 2004) (Appendix E).

With the executive powers of the local authorities they can adjust the playing field to direct it in such a way that it improves the liveability of the city. Stathopoulos et al. (2012) classifies policies into six classes: '(a) market based measures, (b) regulatory measures, (c) land use planning, (d) infrastructural measures, (e) new technologies, and (f) management measures.' All these measures classes can be of a different nature as well, this can be regulative, stimulating, facilitating or coordinating (Quak et al., 2011).

Local authorities preferably do not intervene if it is unnecessary and leave it to the market if it is possible. Quak and Tavasszy (2011) name directions for types of solution to improve urban freight logistics sustainability. The three different types are: logistical, technical and policy related solutions. To get to a viable solution multiple types need to be used. Only using one solution type can lead to unwanted unexpected effects (Quak and Tavasszy, 2011).

Due to urbanization urban areas get more densely populated. As already depicted in figure 2.1 this results in an increased transport demand co-accelerated by economic growth. Accessibility of the city is important for the residents, both for their own mobility needs but also for their need for goods that need to be transported to their urban area.

2.2 BACKGROUND: PHYSICAL INTERNET

In this section the Physical Internet will be explained on the basis of different sub sections.

2.2.1 Defining the Physical Internet vision and concept

The Physical Internet is a vision that could fundamentally change current logistics operations (Montreuil, 2011). Montreuil et al. (2012) even thinks that 'we face a revolution as radical as the Internet Revolution.' Ballot et al. (2014) defined the Physical Internet as 'a global logistics system based on the interconnection of logistics networks by a standardized set of collaboration protocols, modular containers and smart interfaces for increased efficiency and sustainability'.

The term refers to the internet because it is inspired by the digital internet that efficiently sends digital packages over a vast network of hubs and links. However, the Physical Internet does not aim to copy the digital internet (Montreuil, 2011). Crainic and Montreuil (2016) state the fundamental differences between the two: 'physical objects travel much slower than data, each move and sojourn in the Physical Internet induces a cost, lost data packets in the Digital Internet can be transmitted again at negligible cost and delay, and so on.'

The digital internet shows how a global and open system can work with universal inter-connected network that is realized through standardization in encapsulation, protocols and interfaces (Crainic and Montreuil, 2016). The metaphor helps with shaping the vision of the Physical Internet. Standardization and openness are fundamental for a successful network that enables supply-chain collaboration both vertically and horizontally. Seamless communication with others and retrieving real time information about packages can be enabled in the Physical Internet (Mervis, 2014).

Treiblmaier et al. (2016) summarize all this information in the following definition: '.., the PI aims to organize the transport of goods similar to the way data packages flow in the digital Internet. Through sharing of resources such as vehicles and data as well as designing transit centers, which enable seamless interoperability, the transport of goods will be optimized with regard to costs, speed, efficiency and sustainability. To achieve this, a set of common and universally agreed-upon standards and protocols are needed to facilitate horizontal and vertical cooperation between companies.'

Montreuil defines the Physical Internet in four different tiers (Montreuil et al., 2012) and in 13 characteristics. These characteristics are linked to unsustainability issues of current logistics. The four different tiers and 13 characteristics will be explained in the next subsection.

2.2.2 Characteristics of Physical Internet

A convenient point to start in defining the characteristics of Physical Internet are the characteristics named by Montreuil (2011). Montreuil names these to define how PI can counteract unsusainability symptoms that can currently be perceived in logistics systems. Those symptoms

1. Encapsulate merchandises in world-standard smart green modular containers
2. Aiming toward universal interconnectivity
3. Evolve from material to PI-container handling and storage systems
4. Exploit smart networked containers embedding smart objects
5. Evolve from point-to-point hub-and-spoke transport to distributed multi-segment intermodal transport
6. Embrace a unified multi-tier conceptual framework
7. Activate and exploit an Open Global Supply Web
8. Design products fitting containers with minimal space waste
9. Minimize physical moves and storages by digitally transmitting knowledge and materializing objects as locally as possible
10. Deploy open performance monitoring and capability certification
11. Prioritize webbed reliability and resilience of networks
12. Stimulate business model innovation
13. Enable open infrastructure innovation

As indicated by Montreuil these characteristics define the vision of PI. This also means that some characteristics feel more like things that could follow out of a successful implementation of PI. These things do help with creating a vivid representation of PI implementation but might not be the core characteristics of PI.

By looking at definitions of PI the core characteristics can be extracted. Since there are multiple understandings of PI it is needles to say that this represents an interpretation of the concept as well. The characteristics defined from the definitions are linked to the characteristics named by Montreuil. The remaining characteristics will be discussed on relevance to the core of the Physical Internet.

The definitions earlier named in section 2.2.1 by Ballot et al. (2014) and Treiblmaier et al. (2016) will act as a guidance to revealing the core characteristics of PI. Ballot et al. (2014) states the following definition:

"A global logistics system based on the interconnection of logistics networks by a standardized set of collaboration protocols, modular containers and smart interfaces for increased efficiency and sustainability (Ballot et al., 2014)"

The *'global logistics system'* part refers to characteristic number 7 that names the exploitation of the 'Open Global Supply Web'. Together with the *'interconnection of logistics networks'* it also links to characteristic 2 about 'universal interconnectivity'. These *'logistics networks'* can be found on multiple tiers as described and this also links it to characteristic 6, the Russian-Dolls style as Montreuil (2011) describes it. Ballot et al. (2014) also names a *'standardized set of collaboration protocols, modular containers and smart interfaces'* which shows that standardization is fundamental to PI and links to characteristic 1, 3 and to a lesser externet also 4. In the end of the defintion Ballot et al. names the goals of PI as *'increased efficiency and sustainability'*.

The second definition of PI is by Treiblmaier et al. (2016) and is of a more practical nature. It tries do define how PI could work in a real environment and what kind of results this has. The definition is the following:

"... the PI aims to organize the transport of goods similar to the way data packages flow in the digital internet. Through sharing of resources such as vehicles and data as well as designing transit centers, which enable seamless interoperability, the transport of goods will be optimized with regard to costs, speed, efficiency and sustainability. To achieve this, a set of common and universally agreed-upon standards and protocols are needed to facilitate horizontal and vertical cooperation between companies. (Treiblmaier et al., 2016)"

At first the analogy with the digital internet is named, this analogy links to the global and interconnected part of the Physical Internet stated by characteristic 2 and 7. After that *'sharing of resources'* is named to optimize transport of goods over interoperable networks. This links to multi-segment (intermodal) transport named in characteristic 5 and also to the multi-tier conceptual framework from characteristic 6. In this part the goals are also named, optimization *'with regard to costs, speed, efficiency and sustainability'*. To achieve these goals Treiblmaier et al. (2016) names *'agreed-upon standards and protocols'* that link to characteristics 1 and 2.

From the definitions of Ballot et al. (2014) and Treiblmaier et al. (2016) links can be drawn to Montreuil's characteristic 1, 2, 3, (4), 5 and 7. This could indicate that those represent the core characteristics of PI. The remaining characteristics are assessed based on their relevance to the PI concept.

Next to the characteristics (Montreuil et al., 2012) also mentions four different layers of PI. These layers are more related to the physical network that the PI should consist of. This includes the entire supply chain, from open production in the *realization web* to open distribution and warehouses in the *distribution web*. The *mobility web* consist of unimodal and multimodal hubs that facilitate the interconnection of networks. The realization web and the distribtuion web together make up the *supply web*. All the webs together result in the *logistics web* of PI. This is all illustrated in figure 2.6.

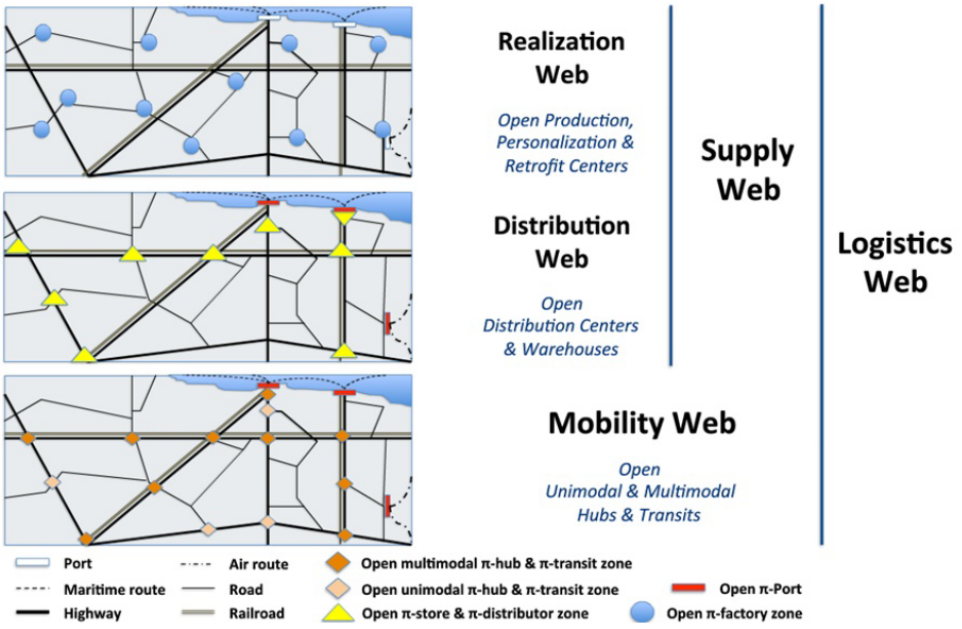

Figure 2.6: The four layers of the Physical Internet (Montreuil et al., 2012)

From the characteristics named by Montreuil (2011) number 8 to 13 were not strongly represented in the analysed definitions of Ballot et al. (2014) and Treiblmaier et al. (2016). To make sure the remaining

characteristics are of less importance in comparison to the characteristics found in the definition they are assessed.

Characteristic 8 is about designing products to fit the standardized container format, the so-called PI-container. The standardization of this loading unit is represented in the core characteristics of PI. This characteristic describes something that can be a result of this standardization. This explains why it does not need to be included in the core characteristics of PI.

In characteristic 9 the of idea of digitally transmitting knowledge and materializing objects locally is proposed. This offers a refreshing view on changing the current transport system but it feels like the next step of PI. Montreuil (2011) states that PI then also should be connected to 'open distributed flexible production centres'. The first step of PI is reforming the current logistics system as represented in the analysed definitions.

Monitoring an interconnected system like PI where PI-containers can move 'freely' through a network of hubs is very important, characteristic 10 refers to this. However it is of great importance it also is a condition of PI and does not describe its core meaning. It is something than is needed when implemented because of the core nature of the technology.

An interconnected network can make use of its wide variety of options to make it more resilient, as stated by characteristic 11. If one hub or link is inactive those other options can be used to make sure delays are kept to a minimum. In the contrary, a private supply network has limited options which makes it less resilient. Since this characteristic is in direct relation to the open supply network and can be a valuable consequence of this core characteristic it is not included in those.

The stimulation of business models is mentioned in characteristic 12. This is eminently a result of a implemented Physical Internet. Because it is a consequence of PI composed of the core characteristics it is not a part of those.

As an example, due to the standardization of sea containers a lot of infrastructure is adjusted to the dimensions of those loading units. With this infrastructure those loading units can be handled in a more efficient manner. A similar thing can happen after introduction of the PI-container. This is a consequence of the standardization of the loading units which does not make it one of the core characteristics.

2.2.3 How stakeholders act in the Physical Internet

Also in PI the three types of operational actors described by Marcucci et al. (2017) can be distinguished. Those actors are the shippers (1), logistics service providers (2) and the receivers (3). Especially the roles of shippers (Ciprés and de la Cruz, 2019) and for logistics service providers Simmer et al. (2017) will significantly change.

When looking at the characteristics of PI (section 2.2.2) it is strongly dependent on sharing of both data and assets. Besides that standardization of packaging and collaboration protocols are the foundation of this system. The PI should realize the shift from private supply network to open supply network (Montreuil, 2011). This directs to outsourcing logistics, or at least, not merely taking care of your own. According to Crainic and Montreuil (2016) 'the retailers and manufacturers do not anymore exploit their dedicated distribution centers'. In this sense an LSP is an appropriate stakeholder to take care of those logistics services operating in an open supply network. The degree of openness of the supply network and the supply network belonging to that are depicted in figure 2.7.

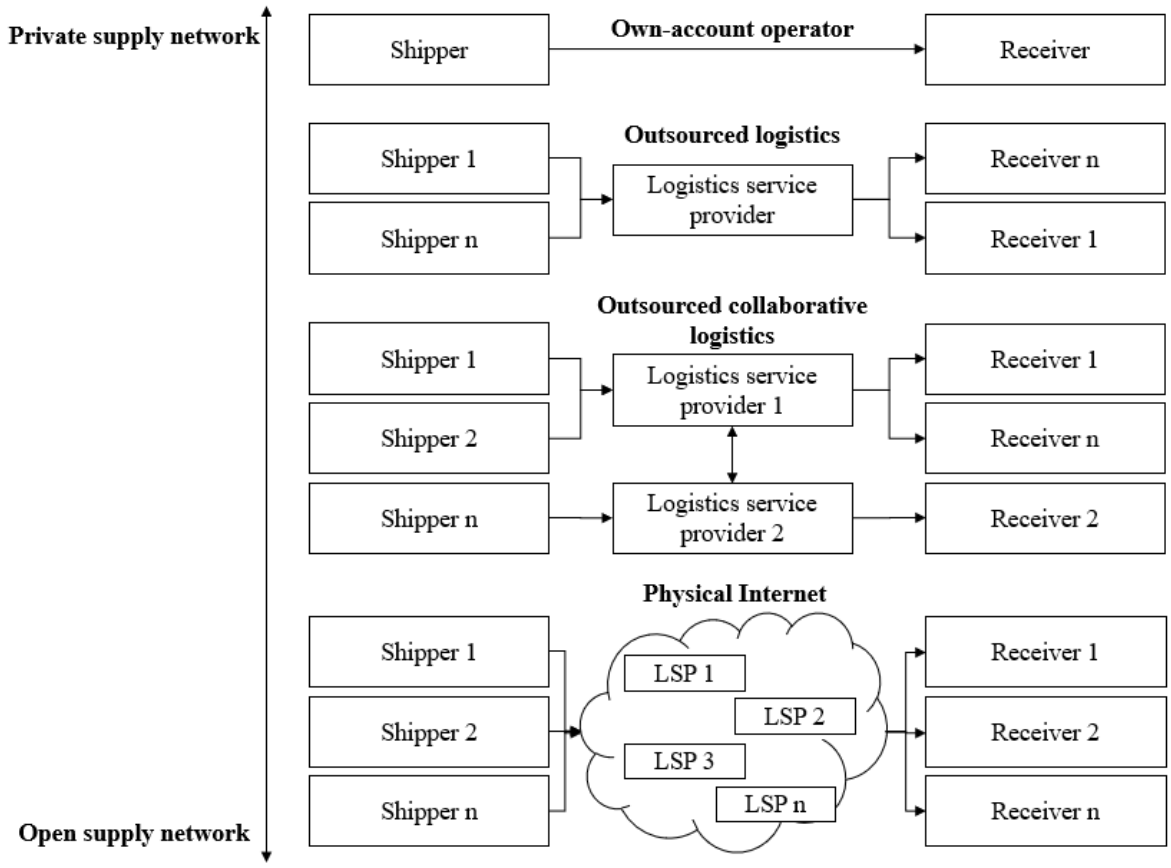

Figure 2.7: From a private supply network to an open supply network (van Son, 2020)

This could mean a more important role for the logistics service providers but according to Ciprés and de la Cruz (2019) decisions will be made by shippers in a Physical Internet. The shipper moves their goods trough the open supply network. This means that different links and hubs can be used regardless of the logistics service providers that operates that part of the network. In the current system the logistics service provider defines the route and the options are limited to private supply network Montreuil (2011). The change in decision making means 'a paradigm shift for mobility and logistics' according to Ciprés and de la Cruz (2019).

Simmer et al. (2017) argues that the first steps to collaboration as proposed in the PI vision are horizontal collaborations. Eventually LSPs need to share their assets in order to come to a more efficient network according to the PI vision. The case study from Simmer et al. (2017) revealed that in Austria logistics companies are mostly positive with regards to horizontal collaborations. However, they see barriers like the fear of antitrust fines and high administrative input.

That the first step towards a PI is horizontal collaboration can be linked to figure 2.7 as well. Outsourced collaborative logistics makes use of multiple private supply network that form a bigger network together. As these collaborations grow the PI vision will become more real. This is why LSPs can have a very important role in the shift to this new logistics system. Eventually shippers can obtain more decision power but this can only happen when LSPs start to connect their private supply networks.

2.3 PHYSICAL INTERNET CHARACTERISTICS IN URBAN FREIGHT LOGISTICS

In section 2.2.2 the characteristics of PI are discussed and selected based on definitions from the literature. After this selection still an abundance of characteristics remained. In order to get a more workable definition of PI the set of characteristics is reduced one more time. Finally, the current concepts that can be observed in Dutch urban freight logistics are linked to those characteristics.

2.3.1 Workable definition of PI based on characteristics and the connection to urban freight logistics

Most of the characteristic in section 2.2.2 were named by Montreuil (2011). But not all of those characteristics apply evenly to urban freight logistics. Besides that, there may even be more characteristics of PI since the definition of the concept can be seen as ambiguous. To deal with this situation a multitude of PI characteristics were chosen to represent the concept in this research. The set of characteristics is based on literature about both PI and urban freight logistics, and on interviews. After this the PI concept is linked to urban freight logistics.

Mervis (2014) states that the foundation of PI lies in openness and standardization. Those two characteristics should form the base of the connection between logistics networks. The open system should be accessible to everyone. In this system data can be shared which makes sure that assets can be shared as well. On the other hand there is standardization in both modular containers and collaboration protocols. This makes sure that logistic networks can be conveniently interconnected. This results in the following distilled set of fundamental characteristics:

- Open system
  - Data sharing
  - Asset sharing
- Standardization
  - Standardized collaboration protocols
  - Standardized modular containers

The characteristics named are all linked together as well. The standardized modular containers make it possible to efficiently share data about specific goods that need to be transported. Sharing the data should be done in such a way that multiple stakeholders can work conjointly so that is where the standardized collaboration protocols come in. Asset sharing can be achieved with the use of these standard modular containers and standard collaboration protocols for data sharing.

In figure 2.8 a schematic representation of what a system with PI characteristics could look like is depicted. All the earlier named characteristics are reflected in this figure. The physical flows are depicted by a solid line, those flows are standardized by the modular containers. The dotted lines represent the digital flows of information, those information flows represent the standardized collaboration protocols. All the digital lines are connected to an open system where data can be shared. With this information the floating and fixed assets depicted in the 'PI-cloud' can be used in an efficient manner.

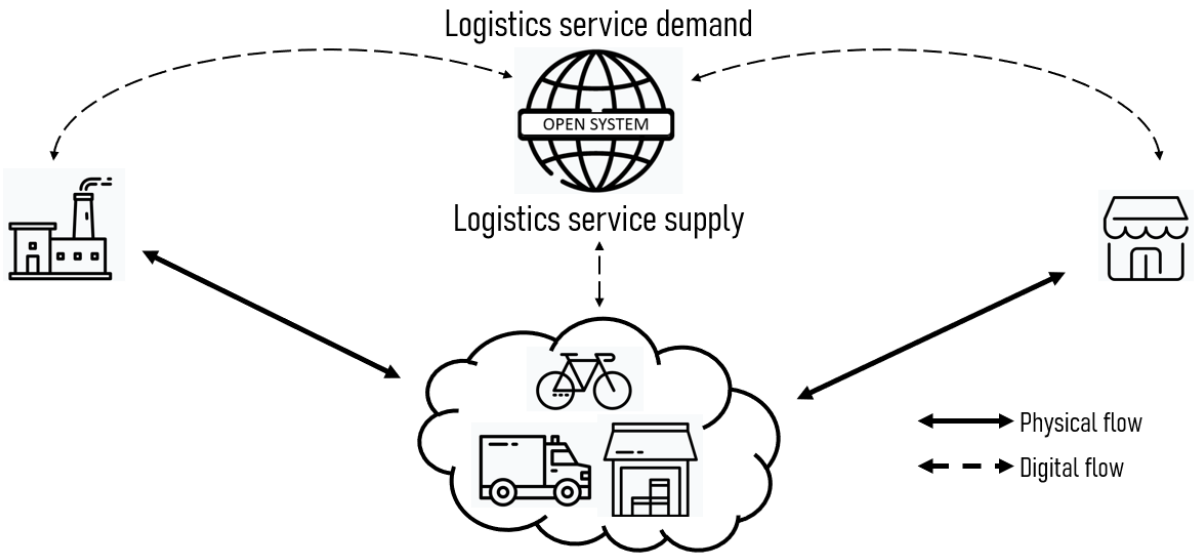

Figure 2.8: A schematic representation of a system with PI characteristics (van Son, 2020)

To analyse how this system can be useful in urban freight logistics the concept has to be operationalized. Crainic and Montreuil (2016) linked PI to urban freight logistics in order to reveal the possibilities of this novel concept for the final distribution stage. Further, Quak et al. (2020) states that it a promising vision for urban freight logistics. PI aims at a structure with multiple hubs that are all linked to each other. This can be translated to urban freight logistics by using (already existing) hubs for consolidated city distribution. These hubs do not necessarily have to be located at the outskirts of urban areas while PI also allows flows to be consolidated in an earlier stage. When users of the logistics system can operate in an open supply network they are not bounded to private distribution centres which might not be as useful for certain urban areas.

The urban area is another tier of the framework where logistics have to handled differently than, for example, on a global level (Montreuil, 2011). In urban areas other rules apply with regards to e.g. emissions, vehicle sizes and vehicle weights. The hubs at the outskirts of urban areas need to be openly accessible and according to the PI concept they should efficiently handle goods encapsulated in PI-containers. Also in this process all the fundamental characteristics appear.

The key to the concept is that not all different cities are treated as unique. The PI concept relies on standardization which can only be beneficial if it is used on a bigger scale. Besides that, the major users of the logistics system do not only serve a single city. This is why the interconnection with other cities is 'a fundamental key' for the PI concept in urban freight logistics (Crainic and Montreuil, 2016).

The representation in figure 2.8, the named characteristics of PI and the operationalization in urban freight logistics can also be connected developments that can currently be observed in Dutch urban freight logistics. Further, the use of the PI characteristics might even break down certain barriers that current concepts have to deal with. The most important development is the implementation of an urban consolidation together with cross-docking to less impacting transport modes for last mile urban distribution. A lot of work is published concerning this topic the past decade Quak et al. (2020). A very promising concept that currently has a hard time to become economically feasible van Duin et al. (2016). In the next section it is discussed how this concept relates to the PI vision and how the PI characteristics might be useful for these kind of developments.

2.3.2 Urban consolidation centres in relation to PI

The PI vision on city logistics (Crainic and Montreuil, 2016) and the UCC concept are definitely not the same but there are certain similarities. A UCC should be an 'open system' where multiple parties can make use of the same assets. Because the data of shipments is shared with the UCC operator shipments

from multiple parties can be consolidated. In this manner data sharing makes asset sharing possible. Eventually, the final distribution can be handled by the UCC operator or by an independent transport provider. The UCC concept is based on collaboration and a hub structure, just like PI. Usually the goal is to operate this last mile with a zero emission mode that makes urban freight logistics more sustainable. The use of these specific modes is not an ultimate goal of PI since this is efficiency and, due to that, cost reduction. But also with the use of conventional vehicles in a more efficient way urban freight logistics can become more sustainable, but it has to be noted that zero emission is not inherently coupled to the PI characteristics.

The latter is one of the major differences between the UCC concept and PI, where UCCs are commonly established with urban liveability (Allen et al., 2012) in mind the main goal of PI is efficiency. Certainly, the PI concept can help with achieving sustainability goals but it is not the ultimate goal. Another difference is that PI has its focus on the global system, urban freight logistics is taken into account on level three (Montreuil, 2011) but in PI this is just part of the story (Crainic and Montreuil, 2016). A main reason for this global approach is the dependence on standardization in both loading units and collaboration protocols. These must provide access to standardized services in the open supply network. On the contrary, UCCs try to bind customers by providing additional services which can be tailor made (Quak et al., 2020). These services are accessible to anyone that wants to become a client but are bonded to a few UCC locations in the private supply network of the UCC operator. The named differences are organised in table 2.1.

Table 2.1: Differences between the UCC concept and the PI concept

	UCC concept	**PI concept**
Main goal	Sustainable last mile	Economical efficiency
Scope	Urban and regional	Global
Standardization level	Tailor made services	Standardized services
Openness	Open to clients	Open to everyone

The barriers that the UCC concept currently has to deal with are described in section 2.1.3. When combining this view on UCC's and urban logistics with the things PI can offer, some of the barriers to economical feasibility could fall. In a PI the load (shipper) determines the optimal route regarding costs and time. If this route makes use of a UCC all the parties involved will get paid accordingly to their contribution. This will take away the problem of fragmented cost savings. In a PI it is also easier to get to a certain critical mass since PI is inherently not limited to just a single urban area. Also, the PI is built on information exchange between parties which will ensure contact between different parties.

The previous paragraph shows that PI could be a solution to these problems, but these barriers are here for a reason and that is probably the same reason that PI is not here yet. It is difficult to implement such changes to the vast logistical system that is currently in place. The PI proposes fundamental changes to the basis of how logistics work right now. This is why a UCC might be seen as a first step towards an open supply network since it is based on the idea of collaboration. Simmer et al. (2017) notes that this process could probably take decades but horizontal and vertical cooperation are indeed the first steps, this process should be accelerated by digitization. According to Crainic and Montreuil (2016) there is a need for pilot studies and the history of UCCs can provide a lot of information on collaborative logistics (Björklund and Johansson, 2018).

But with a system like PI it is questionable if a dedicated UCC still needs to be established. There are already business parks surrounding the big Dutch cities (e.g. Amsterdam figure 2.9) which have the potential to already serve the city sustainably when they operate more efficient by sharing their assets with companies that provide zero emission transport solutions.

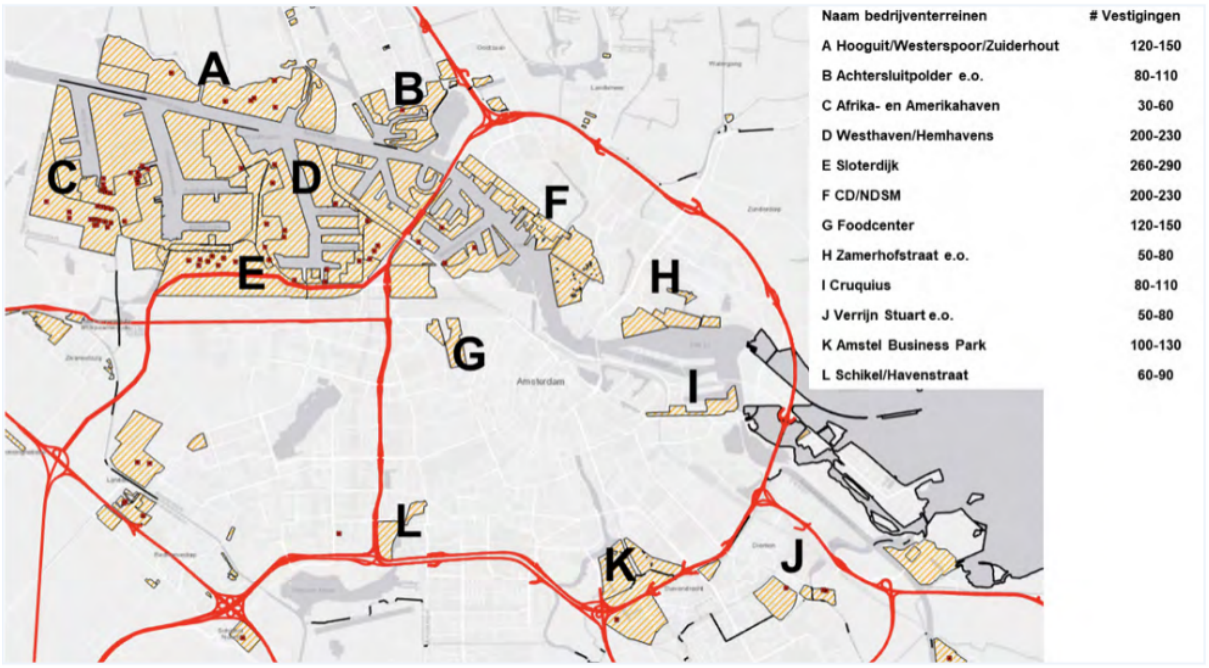

Figure 2.9: Strategically located logistical business parks in Amsterdam (Topsector Logistiek, 2019)

In an open supply network multiple locations surrounding urban areas could act as urban hubs in the PI network (Montreuil, 2011) (Crainic and Montreuil, 2016). Shipments could be consolidated and shipped inside the urban area with zero emission vehicles. In the current situation this certain zero emission vehicles belong to a certain UCC. This forms new private supply chains within the urban areas, however, it combines the private supply chains from outside the urban area. In a PI network a vehicle is not merely in use for a single hub but for all the hubs in the network. This makes sure that operation can become more efficient since it the network can adjust itself to the location of the demand.

According to Montreuil (2011) PI has the potential to resolve all of the three overarching types of unsusastainability issues named by Quak (2008) that are explained in section 2.1.2. But it has to be taken into account that the ultimate goal of PI is efficiency and not environmental, social or economical sustainability. When the PI concept is explained as an optimization of logistics networks the outcome will always be the most efficient and cost effective option. If a zero emission vehicle is more expensive than a conventional vehicle this will never be an optimal solution. This means that legislation is still very important to set constraints on the system which shows the importance of a neutral body (Ciprés and de la Cruz, 2019).

It can be concluded that PI can be a very promising concept for making urban freight logistics more sustainable. Most of the research that is done is conceptual or quantitative and not a lot is based on survey or interviews (Treiblmaier et al., 2016). This is why in this research the focus is on stakeholders perspectives regarding PI in urban freight logistics and how it can help with resolving the sustainability issues (Montreuil, 2011). Since the urban freight logistics is inherently coupled with regulations (Government of the Netherlands, 2018a) the municipalities are included in the research. Besides that, the logistics service providers are also taken into account since PI aims for outsourced logistics. To widen the scope a little bit the branch organizations of the logistics sector are included as well, more on this can be found in section 3.4.

2.3.3 The different perspectives hypothesized

This section will describe what are the expected perspectives from the different stakeholders groups on the usability of PI characteristics in urban freight logistics. This will be divided in to three paragraphs that are all related to one stakeholder group. In every paragraph the concerned stakeholder is related to the PI characteristics and urban freight in general.

Municipalities

For municipalities liveability, accessibility and public health are important (Van Duin et al., 2018). The current amount of vehicle movements compromises all of these value propositions. That is why a new logistics concept that can positively influence these criteria might be very interesting. Since the municipalities are no operational stakeholders they do not have to deal with the operational consequences of the system. For them it is important what the effect is on the earlier named criteria. When looking at data sharing and assets sharing municipalities might want to play a role in this by facilitating a platform or by stimulating promising projects. Loading unit standardization is something that the governments will not want to develop. Other standards, like for data, can be influenced by governmental organizations when they develop a platform. A barrier for the government is that they do not want to over regulate urban freight logistics since this might scare away business from settling in the city centre.

Logistics service providers

For logistics service providers most of the PI characteristics would mean an impact on their daily operations. According to Gasperlmair et al. (2016) big market players do not want to give up investments that they have done in their own supply network and will try to protect it. A quite negative attitude can be expected from these players towards the PI characteristics. LSPs could already believe they operate in an efficient matter and do not like the idea of changing that. Simmer et al. (2017) did reveal that some LSPs seem to be willingly to open their network and share their assets in a collaboration. A collaboration is something different than what the PI vision proposes but it can be seen as a first step. Besides that, LSPs will probably see barriers for an open platform regarding data safety, competition issues and service levels.

LSPs will not always be negative to regulations as long as they account for every stakeholders and create a level playing field. For example, some LSPs - like the new one aiming for the ZE market - see opportunities in gaining market share after a ZE zone is implemented. Other LSPs, that do not want to change their operations or do not see opportunities will be less welcoming to these regulations.

Branch organizations

The branch organizations represent the logistics sector and will try to fill in their needs. This means that they will be very cautious with their answers. An example of this comes from Van Duin et al. (2018) where the branch organization for shippers had a more negative attitude towards regulations than the shippers themselves. The same barriers to an open system as with the LSPs will be seen. On the other hand there should be a believe that urban logistics operations have to change. But this does not mean that the system should change immediately accelerated by regulation. Innovations like the PI characteristics can be a good thing but they should be implemented in a way that no one is left out. The same holds for the ZE zones, LSPs should be ready for these kind of changes before they should be implemented.

3 METHODOLOGY

3.1 METHODOLOGY CHOICE

As explained in the introduction of this report little is known about stakeholder perspectives in relation to PI. This is because relatively small amount of research has been conducted based on, for example, surveys and interviews (Treiblmaier et al., 2016). The conceptual and quantitative research shows promising results (Ballot et al., 2012) (Pan et al., 2014) (Yang et al., 2017), but this does not always appear to be directly translated into practice, as can be seen with the UCC concept (van Duin et al., 2012). That is why it is important to investigate whether a concept such as PI is actually found to be promising by the stakeholders in urban freight logistics.

PI could cause a shift of influence from logistics service providers to shippers (Ciprés and de la Cruz, 2019). This makes it evidently interesting and important to know whether logistics service providers are also positive about this new concept. Since, ultimately, there will still be a major role for the logistics service providers in the PI concept, as the concept rests on the idea, logistics as a service .

In addition, there ofcourse always is influence of municipalities in the urban environment. This makes it also interesting to investigate how these municipalities value the PI concept. Because the research is focused on urban distribution, it is also investigated how the stakeholders view the current state of affairs in urban freight logistics, independent of the PI concept.

By including the view on the PI concept and the current state of affairs in city logistics, these two visions can be linked. This provides additional insight into the applicability of the concept in the current urban environment. Because the literature still lacks studies related to the views of stakeholders, a method will have to be used that focuses on these stakeholders. This means that more quantitative methods such as a social cost-benefit analysis cannot be used.

However, it could be investigated on the basis of interviews or surveys. The advantage of interviews is that there is personal contact with each stakeholder and that all answers can therefore be well placed in context. An interview can be conducted in a structured, semi-structured or non-structured manner. If a small number of interviews are conducted, it can be less structured because the total amount of data can then still be processed. With a large number of interviews, it is better to do structured interviews so that the large amount of data is easier to handle and to compare (Dumay, 2009). However, the disadvantage of interviews is that it will always remain a fully qualitative method that depends on interpretation.

A survey can provide a solution here because it is possible to search for significant correlations between answers on the basis of quantitative statistical analysis. In this way it is possible to draw a accurate conclusion without the need for own interpretation. The disadvantage, however, is that a respondent does not have the opportunity to express themselves personally on the subject.

Table 3.1: Differences between methodologies

Interviews	**Survey**	**Q-methodology**
Own interpretation	Less room for own interpretation	Own interpretation of survey results and validated
High amount of context	Little amount context	Medium to high amount of context
No statistical analysis	Statistical analysis	Statistical analysis supported by context
-	Shows correlations between results	Shows correlations between participants
Perspectives based on qualitative data	Perspectives based on participant characteristics	Perspectives based on both quantitative and qualitative data

Combining these two methods can thus provide a qualitative and quantitative approach to the subject, which is what Q-methodology is well suited for. Based on a survey, Q-methodology looks for different perspectives in a group of respondents by looking for correlations between the respondents instead of between their answers. In addition, this survey consists of statements that originate from the discourse considering the topic. This discourse is derived from interviews, scientific literature and grey literature.

The first step is to form the discourse by analyzing the sources just mentioned and conducting interviews. In the second step, the statements from the discourse are ranked by the participants and analyzed in a statistical, quantitative way. However, this quantitative method also offers room for interpretation. This interpretation is fed back to the respondent for validation in order to see whether the perspectives formed do indeed correspond to reality. This makes it a so-called mixed-method and therefore very suitable for this research. (Ramlo, 2016)

Q-methodology will be further explained in this chapter. The various steps provide a guideline through the chapter that describes how this research was conducted. This will eventually lead to the results in the next chapter.

3.2 Q-METHODOLOGY

Q-methodology is based on gathering information from different stakeholders in a certain area of interest. This information is retrieved by constructing a survey which exists of rating statements regarding the subject relatively to one another. The statements are retrieved from different sources and should represent the discourse of the topic. The outcome of the survey can be used to reveal different perspectives on the topic. The perspectives have a relation to a group of participants that share a similar believe. Watts and Stenner (2005) states that q-methodology is an 'exploratory technique' and it 'cannot prove hypotheses'.

According to Webler et al. (2009) it is important to state the core goals of the q-research. Besides the goal of the research this also names the context and what kind of perspectives need to be understood. For this research the answers on the questions of Webler et al. (2009) are the following:

1. In the context of *making urban freight logistics more sustainable.*
2. I want to understand *the different perspectives on implementation of PI characteristics in urban freight logistics.*
3. In order to *determine what PI characteristics are deemed promising for making urban freight logistics more sustainable.*

A q-analysis consists of five different stages that are explained below. In this section a short introduction of the stages will be given. The rest of this chapter will be structured according to these stages.

Q-set (section 3.3)

The first step in the process is the creation of the Q-set. This set consists of statements about the implementation of PI characteristics in urban freight logistics. These statements originate from information of a literature research - on both scientific and grey literature - and interviews conducted with experts. The information that is gathered will form the discourse about the topic.

With this information the statements will be thought out fitted to implementation of PI characteristics in urban freight logistics. The gathered statements are reviewed and selected for the final questionnaire. Less than 60 statements should be used since it has to be manageable for the respondents (Watts and Stenner, 2005). The Q-set also determines the sample size in this research method, this in different in relation to other research based on surveying stakeholders where the number of participants defines the sample size.

P-set (section 3.4)

The participants of the Q-analysis are defined in the P-set. In this set multiple stakeholder groups are represented that are related to urban freight logistics. The number of participants in the p-set is of less importance since information is gathered about a specific, predefined set of stakeholders. It is not the goal to conduct research that tells something about the entire population.

Q-sort (section 3.5)

As mentioned earlier the statements (Q-set) are presented to the participants (P-set) in a specific format. An example of a format for a Q-sort can be found in figure 3.1. It shows that the more extreme options (-5, 5) have the lowest amount of spaces for placing certain statements. On the other hand, the most neutral opinion (0) has the highest amount of spaces for placing certain statements. This format imitates a normal distribution and forces participants to rate statements in comparison to each other.

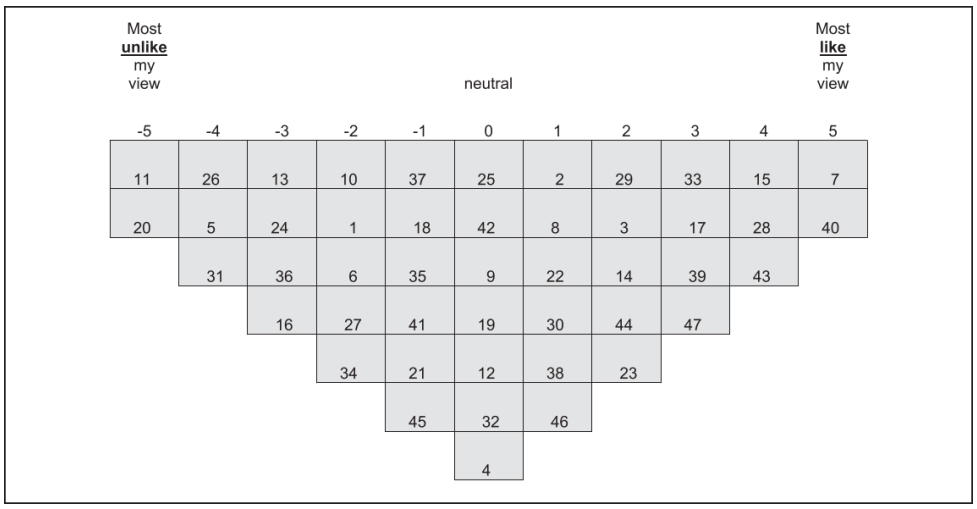

Figure 3.1: Example of a Q-sort (Ramlo, 2016)

Q-analysis (section 3.6)

When all the statements (Q-set) are filled in to the format (Q-sort) by the participants (P-set) the results can be analyzed in the Q-analysis. A factor analysis can reveal the participants subjectivity and by that the they can be grouped. Per group the dominant perspectives can be distilled from the corresponding Q-sorts. Besides that, the participants are asked to explain their choices for the most extreme options. This helps with understanding discourse in the different perspectives per group of participants.

Validation (section 4.6)

According to Ramlo (2016) validity is of no concern in Q-methodology since 'a person's Q sort cannot be right or wrong like a scale response'. But another type of validation is needed with the participants itself. After the different groups are separated based on correlations between Q-sort a perspective for a group can be formed. Feedback on these perspectives is asked to the participants again, does this perspective match the thoughts of the participants?

3.3 Q-SET

In this chapter the statements are presented related to the implementation of PI characteristics (section 2.2.2) in urban freight logistics. Next to the PI characteristics four dimensions are taken into account as well. Together with the statements the explanation from the discourse is added as well, this is based on interviews, scientific literature and grey literature. The statements that are presented is this chapter will be used a the Q-set for the Q-sort.

3.3.1 Statement dimensions

Every PI characteristics will be matched a dimension, those will be present in a balanced amount. The dimensions that are used are the following, the number after the dimension shows how many statements are related to this in the final Q-set:

- Logistics dimension, 9 statements
- Data dimension, 8 statements
- Market dimension, 9 statements
- Societal dimension, 8 statements

Logistics dimension

This dimension relates to the operational part of the urban freight logistics. It includes how logistics operations are organized, what assets are used and what kind of services are offered. All these things can be subject to change with a certain implementation of Physical Internet. Physical Internet relies on different logistics organization types like the focus on hub-to-hub transport instead of point-to-point. Besides that, the standardized containers change the form of the assets that are being used.

Data dimension

A fundamental characteristic of the Physical Internet lies in the sharing of data. This dimension relates to that by including, data availability, data usage and what kind of technology is used. The availability of data is the key to success for implementation of Physical Internet characteristics. Open system data sharing is a major change from the current situation.

Market dimension

An implementation of a Physical Internet like system can lead different dynamics in the market. A more open system and the sharing of assets this could potentially lead to bigger companies taking an ever bigger share of the pie. On the other hand it can be conceived as a system that is open which means that everyone can contribute.

Societal dimension

In this report Physical Internet is linked to urban freight logistics. On the one hand it is linked to potential cost reduction due to efficiency gains but on the other hand it should also contribute to resolving societal issues like noise nuisance and air pollution. It should not be forgotten that it can also have negative societal effects related to, e.g., working conditions.

Besides that, the main driving force behind making urban freight logistics more sustainable is urban livability. This means that urban liveabilty is compromised by current logistics operations. Municipalities try to change this with regulation, this means that statements related to policy are also linked to this dimension.

3.3.2 Statements related to PI characteristics

In this section the statements per PI characteristic are presented together with the corresponding reasoning from interviews, scientific literature or grey literature. The final Q-set with the corresponding PI characteristics and dimensions per statement can be found in appendix B.

Data sharing

A fundamental aspect of the Physical Internet is the exchange of data. This data can be used to make logistical processes more efficient by removing unnecessary transportation or storage by sharing assets (Cruijssen et al., 2007). The sharing of assets is discussed in the following subsection. This section focuses on the limiting factors and possibilities in data-sharing itself. Besides that data sharing can also be used to improve information provision in the current supply chain which can improve chain efficiency.

Simmer et al. (2017) states that awareness raising and information sharing are important first steps to a Physical Internet. Logistics service providers have fears regarding antitrust fines and high administrative input. Both Simmer et al. (2017) and Cruijssen et al. (2007) mention that collaboration only originates when all the partners see benefits for themselves. Besides that, 'trust between the actors, setting of precise conditions and shareable IT structures' are important as well Simmer et al. (2017).

Statements that follow from this are:

1. Most logistics companies are not digitally ready for data sharing while they should be in this day and age.

   As already addressed in this report the logistics sector is not characterized as innovative Mervis (2014)) which results in a lot of logistics service providers working with outdated systems. In interview 2 and 5 (appendix A) this was confirmed and stated that digital innovation is needed. Swaak (2017) states that some distribution centres have no clue of the times that trucks arrive to their facility while this information is needed to efficiently share data. Also according to (Simmer et al., 2017) digitization is going to accelerate horizontal and vertical cooperation in logistics.

2. When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.

   Some logistics service providers are already in a more more advanced stage when it comes to data sharing. Other companies do not see the need right now (Nieuwsblad Transport, 2019) but this might change when their competition is able to cut down costs due to data sharing. In interview 5 (Appendix A) it came to light that logistics companies seem to have enough capacity so there is no need to share their data and become more efficient.

3. When data is shared on a large scale the bigger companies are mainly going to benefit from it.

   Stefansson (2002) revealed that there is a risk for smaller companies to be excluded from 'integrating their logistics operations in the supply chain'. As stated in interview 5 (appendix A it can be hard for smaller companies to justify investment costs in systems that are able to share data, this could mean that the bigger companies are mainly going to benefit from.

4. Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.

   As sharing of data could yield a lot of benefits (ABN AMRO, 2019) it might be interesting to create legislation for this next to the green deal: zero emission city logistics. In interview 4 (appendix A) it came to light that sharing of data is the key to success but it is hard to make it happen.

5. A digital disruption in the logistics sector is needed to make companies share their data.

   That a digital disruption can change the logistics sector was named in multiple interviews (1,3,5 and 6). When it suddenly becomes easier to share data more companies might use it. It can be compared with other sector where this kind of disruptions took place, eventually most stakeholders join the platform (Nieuwsblad Transport, 2019)

6. Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major barrier.

   Simmer et al. (2017) states that competitive sensitive can be a barrier for data sharing concepts. From a survey conducted by Ciprés and de la Cruz (2019) it was also concluded that data sharing is a key barrier since it would make systems more vulnerable. But, this changed over the last years according to ABN AMRO (2019), data safety does not seem to be a major barrier to data sharing. Also interview 5 (appendix A) brought up that in reality the fear of sharing competitive information is not a significant barrier.

Asset sharing

One of the characteristics of Physical Internet named by Montreuil (2011) is the 'activation and exploitation of the Open Global Supply Web'. In the current situation logistics mostly operates on private supply chains and supply networks. When opening up those networks a higher efficiency could be achieved. To make the Open Global Supply Chain term more tangible it is operationalized as *open system asset sharing*. According to Sarraj et al. (2014) current logistics operations, especially in FMCG, are wasteful due to a lack of resource sharing.

Melo et al. (2019) states that the 'sharing economy concept' can yield great efficiency in city (urban) logistics. The use of capacity that already exists and monetizing it can be an interesting solution that can yield economical and environmental benefits. This can be both floating assets, like trucks, and also fixed assets, like distribution centres and warehousing facilities. The 'open system' part in 'open system asset sharing' is based on the Physical Internet vision which leaves the thought of long term fixed contracts. The sales of assets should be done on an open platform to avoid the creation of new Private Supply Networks.

Statements that follow from this are:

1. Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.

   The abundance of client specific services offered in urban freight logistics was named in interviews 1,3 and 4 (appendix A). Next to the logistics service that is offered installation, repair or sales can be important side activities. In Van Duin et al. (2018) it was stated that 'service, visibility and marketing via the logistic chain is highly valued.'

2. Efficiently sharing assets will remove the need for dedicated urban consolidation centres.

   Urban consolidation centres are a proposed and implemented solution to urban freight logistics unsustainabilities for a long time already (Van Duin et al., 2018). But ALICE-ETP (2015) states that due to efficient use of logistics capacity these might not be needed. This was also mentioned in interview 5 (appendix A), better use of current assets is more important.

3. Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.

   In interview 1, 2 and 4 (appendix A) it was mentioned that, next to zero emission transport, the reduction of vehicle kilometers is also important next to zero emission transport. Besides that, changing to zero emission vehicles might even cause more vehicle kilometers travelled (Topsector Logistiek, 2019). As mentioned in section 2.1.3 research done on urban freight logistics and the logistics sector as a whole states that efficiency is more important than just using other, cleaner, vehicles (e.g. Binsbergen and Visser (2001), Montreuil (2011), Crainic and Montreuil (2016)).

4. The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.

   A Physical Internet is based of an open supply network (Montreuil, 2011) where fair cost and value sharing is required. Ciprés and de la Cruz (2019) states that the allocation of costs 'could become an issue if not clearly defined'. In interview 5 (appendix A) it was pointed out that costs that are made in urban freight logistics are often hidden. Besides that, certain 'package-deals' can be made between companies, offering a service for free in combination with another service. These 'free' services can possibly harm the usability of PI.

5. Even the introduction of road pricing in urban areas won't increase level of asset sharing.

   As discussed in interview 1 (appendix A) emission based road pricing for freight vehicles on highways will be implemented, it might be an option to extend this to urban areas as also discussed in Van Duin et al. (2018) and Allen et al. (2007). This can become even more important since Fransen et al. (2019) predicts a shift from highways to regional and urban roads due to the new policy. Besides that, interview 2,4 and 5 (appendix A) pointed out that an increased price per kilometer in urban areas could make sharing of assets more interesting. But, de Bok et al. (2020) also modelled the effect of the road pricing policy and came to the conclusion that only small effects can be expected. One of the reasons for this conclusion is that the policy will only modestly impact the total transport costs.

6. Most parties have the will to share assets but the transition costs are currently not outweighing the benefits.

   Sharing assets requires a certain level of digitization which means an investment is needed for a lot of logistics service providers (Nieuwsblad Transport, 2019). This can come with a significant investment costs according to interview 5 (appendix A). Especially for smaller logistics service providers it is hard to justify those investment costs.

7. The logistics sector is based on strong long lasting client relationships which are hard to replace with a system based on asset sharing.

   Clients can have certain long time relationships with their transport providers, as mentioned in interview 3 this can be due to additional services that are provided. In interview 5 it came to light that some clients do not bother to change the way of logistics since it works fine with the current provider (appendix A). A variation in logistics service providers is inherent to the sharing logistics concept, this might cause trouble for such long lasting relations.

8. The current level of data format standardization is generally sufficient for the sharing of assets.

   This statement originates from the literature around Physical Internet (Montreuil, 2011) as well from interview 5 (appendix A). Different companies often use different data formats on their shipments which makes it hard to handle those for other companies. (It is important to mention that the statement is reversed for the sake of balance in the survey.)

Container Standardization

One of the pillars of the Physical Internet is standardization of shipping containers for multiple product sizes. Montreuil (2011) refers to the PI-container as a 'world-standard smart green modular container'. Since this research only aims at improving urban logistics this might not seem suitable on such a small scale. But it is believed that it actually has a potential in urban logistics (interview 1, appendix A).

Research done by Lin et al. (2014) shows that modular sized containers can yield benefits in 'transportation, material handling and environmental perspectives'. By making use of the data from a big US retailer it showed that with modular container a bigger utilization rate could be achieved with a smaller amount of different sized containers than they were using before.

Statements that follow from this are:

1. Difference in data formats on loading units is currently a major barrier to asset sharing.

   Due to different data formats on loading units it can be complicated to handle shipments with different operators (interview 5, appendix A). The question remains if this also is a barrier to asset sharing. Is it because the need to asset sharing is currently not there that the data formats are not aligned or are assets not shared because it is too complicated to change the different data formats?

2. Size standardization of smaller loading units will accelerate the sharing of assets.

   The abundance of different loading unit formats can make it difficult to share assets in an efficient manner. Further, on smaller sized loading units there is no standard format at all. If this would be introduced asset sharing might become easier and get accelerated. Critical sounds are heard as wel, the current loading units are already standardized to a certain extent and that might be enough (Gasperlmair et al., 2016)

3. The current level of loading unit standardization in logistics is adequate for sharing assets.

   The last statement discussed the standardization of smaller load units that is currently not there. However, there is standardization on other levels (e.g. pallet, roll container) which are already in operation. These loading units are already relatively suitable for asset sharing but it still does not happen on a big scale. However, Centre de Routage Collaboratif (2016) showed that with the current standardization efficiency gains already can be achieved. This raises the question if further standardization of loading units will actually contribute to asset sharing.

4. If size standardization is implemented of smaller loading units should be introduced by a governmental organization.

   Inherent to standardization is that an abundance of stakeholders should use the same standards. A new standard should emerge from the industry or from the government. Mervis (2014) states that the role of governmental organizations is really important since the logistics sector is heavily regulated. This might also mean that a governmental organization would be the designated actor to introduce this.

5. Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.

   With the use of standardized modular containers it is possible to more efficiently load vehicles. In urban logistics often smaller shipments take place (Ploos van Amstel, 2017) (Taniguchi et al., 2016) (Marcucci et al., 2017) which can be affected strongly by the standardization of smaller sized loading units.

Standardized collaboration protocols

Standardized collaboration protocols are at the base of data and asset sharing in PI. The idea is that data sharing only works if every actor in the system uses the same protocol. This can feel like a bit of a stretch, the logistics sector is currently quite far from such standardized protocols. This does not mean that this should not be a goal but the steps towards it can differ.

Statements that follow from this are:

1. A governmental organization should be in charge of a standardized data sharing platform.

   In an open system data has to be shared in a secure system in a standardized way. According to Ciprés and de la Cruz (2019) a neutral body can be useful for this function and this could be a governmental organization. In the Netherlands iShare is already introduced to fulfill this function (ABN AMRO, 2019) but not everyone agrees on leaving this activities to a governmental organization (appendix A).

2. An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.

   As there are an abundance of companies that do not have advanced digital systems (appendix A) this can form a problem (Swaak, 2017). This statement is strongly related to the one about the need for digital readiness with companies. It can be said that it does not have to be a problem that some companies can not function properly anymore do to innovation in the market. In the end this is part of the capitalistic system the Dutch economy is based on.

3. An open platform where logistics service demand and supply meet will be the future of logistics.

   Next to the question if an open platform will exclude certain companies from the logistics market the question also arises if such an open platform is the future at all. In other markets we see sharing platforms emerging like Uber and AirBnB (Quak et al., 2020) but this does not have to mean that this will also happen in the logistics sector. According to interview 6 (appendix A) setting up such a platform can be an interesting opportunity.

4. An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.

   As the ultimate goal of PI is not social, economical and environmental sustainability but economical efficiency those things could be compromised (section 2.3.2. An example of this is that when more assets are available in the system these might be used to shorten delivery times and increase economic efficiency but in the end this can reduce efficiency in terms of load factor (van Duin et al., 2016).

5. An open platform for asset sharing causes better competition instead of forming a monopoly.

   This topic was mainly discussed in interview 6 (appendix A). If a third party supplies a open platform where logistics service demand and supply meet this means that no one is excluded from this marketplace. This means that anyone can make their offer on certain demands which could benefit competition. On the other hand it could penalize the smaller companies since they might not have the economies of scale the bigger companies do have. This can also results in a more dominant position for the bigger companies.

General

Besides statements about the PI characteristics also statements regarding urban freight logistics in general are included. These statements are about how the urban freight logistics system currently works and how policy can influence this.

Statements that follow from this are:

1. Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.

   This is something that was mentioned in interview 5 (appendix A) placed in the context of the Netherlands being a country where everybody needs to be heard and no real decisions are made. This means that municipalities try to create a liveable city for their residents but also want to provide a healthy economic climate where businesses can thrive. As stated before urban freight logistics is vital to the urban life as we know it today (Quak, 2008).

2. The introduction of zero emission zones will exclude the smaller companies from the urban logistics market.

   Not all parties that are currently operating in urban freight logistics are capable of making investments in zero emission vehicles. Besides that the supply of those vehicles is scarce as well which makes them harder to get a hold of and increases the price (Broos et al., 2019). If the only possibility to get into the urban area is with a zero emission vehicle parties that do not own one need to outsource their logistics. This could result in the exclusion of smaller, less capital heavy, companies.

3. Zero emission zones are going to provide low emission logistics but will not reduce total vehicle kilometers.

   As already explained in section 2.1.3 smaller electric vehicles will provide a reduction in the amount of air pollution but, on the other hand, might increase the total amount of vehicle kilometers travelled (Topsector Logistiek, 2019). In interview 1 (appendix A) this concern was expressed as well. Governmental organizations do not want to increase transport costs in urban areas so they want to partly subsidize zero emission vehicles. But, if urban freight logistics does not become more expensive there is little incentive to make it more efficient which could mitigate more of the unsustainability issues.

4. The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.

   In section 2.1.4 it was mentioned that a lot of urban freight logistics is executed by so-called own-account operators. This are shippers and receivers taking care of their own logistics activities. These activities are often characterized by low efficiency since such operators can enter an urban area to deliver a small amount of goods (interview 3, appendix A).

5. The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs.

   If a shipper or receivers is already in possession of certain assets to perform logistics activities it might feel 'free' to take care of it yourself (appendix A. When these logistics services are outsources they are confronted with the costs in contrast to taking care of it yourself. As explained with the previous statements these operations are often characterized by a low efficiency.

6. Although the margins are small the logistics sector is not being challenged enough to get more efficient.

   In interview 1 it was brought up that an increasing cost of urban logistics operations would accelerate the process of becoming more efficient. On the other hand, the logistics sector is characterized by small margins. The small margins could indicate an environment that is very competitive and where, consequently, efficiency is very important. In interview 5 (appendix A however, it is stated that logistics service providers often have overcapacity while they do not feel the urgency to become more efficient. This could mean that although the small margins the logistics sector is not being challenged enough to get more efficient.

7. Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.

   In interviews 1,3 and 4 (appendix A) it was brought up that it is important to nationally coordinate policy related to urban freight logistics. Earlier policy on environmental zones created a patchwork of different policies in Dutch urban areas (Evofenedex, 2019). Since logistics service providers are most of the time providing multiple urban areas uniform policies are important. Currently it can be seen that there is a lack of clear guidelines from the national government to specify zero emission zone policies (Nieuwsblad Transport, 2020).

8. Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.

   This was brought up in interview 5 (appendix A) but can be traced back to the literature too. As already mentioned UCCs have a hard time becoming economically feasible (van Duin et al., 2016). In a later report (Quak et al., 2020) one of the reasons named for this is that subsidy 'mystifies the real added values'. In another report the lack of a critical mass is named as a barrier to start cost savings (Expertgroep City Distribution, 2019).

9. Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.

   Specifically in interview 5 (appendix A) this came up. The statement is quite controversial since it is a generalized opinion. But can the progression in making urban freight logistics more sustainable sometimes be seen as 'many word, little practice?' (Quak et al., 2020). As stated before clear guidelines from the national government could be useful for making adequate policy on zero emission urban freight logistics (Nieuwsblad Transport, 2020).

10. Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban logistics affordable.

    Some types of freight vehicles (Euro 6) are already relieved from the restrictions from the Green Deal: ZES (Evofenedex, 2020). This could be needed to keep urban logistics affordable since some companies made long term investments in these types of vehicles. On the contrary there is a movement from progressive companies (ZES25) that do not see the postponement of the restriction as something that is needed (Logistiek.nl, 2020).

3.4 P-SET

As discussed in section 2.1.4 there are multiple stakeholders in urban freight logistics. These are stakeholders that have both an operational and a non-operational nature. To get a clear view on how their perspectives on characteristics of the Physical Internet differ it is important to divide the stakeholders in to certain groups. In this way it can be investigated if there are actually different perspectives and if they belong to a certain stakeholder group or not.

In the Q-survey not all the stakeholder groups are represented. To define the importance of different stakeholders the research topic is analysed by reviewing both scientific and grey literature and, conducting exploratory interviews. For the Q-survey it was chosen to include three different stakeholders groups and two different stakeholder sub-groups.

- Logistics service providers
  - Established logistics service providers
  - New logistics service providers
- Municipalities
- Branch organizations

In this section all the stakeholder groups will be discussed considering their role in the urban logistics system and their importance in relation to the implementation of PI characteristics.

3.4.1 Logistics service providers

As stated in section 2.1.4 a lot of transport is carried out by so called own-account operators. It is believed that this causes a majority of the inefficiencies in urban freight logistics (Ploos van Amstel, 2017). This is in contrast with the relatively efficient way LSP's are executing their logistical operations in urban areas.

It could theoretically also mean that those efficient services should be less costly for both shippers and receivers in comparison to organizing their own logistical services. But apparently own-account operators still choose to not make use of third party logistical services. This because of a high service level received from self-organizing logistics (Stathopoulos et al., 2012) consisting of e.g. specific additional services, high flexibility, low added costs, low-threshold and sales purposes. This could indicate that LSP's need to change their operations according to the wishes of their clients, both shippers and receivers, to gain market share in goods distribution in urban areas.

Following this reasoning it becomes evident why LSP's could take an increasingly big role in more efficient urban freight logistics. This is why the LSP's are an important stakeholder group in the q-analysis. Some LSP's are already applying new business plans based on, for example, sharing assets. These LSP's are often younger companies and operating in the urban area, especially when compared to the bigger established companies that exist for a long time already. In urban freight logistics a lot of newcomers can be identified. It is interesting to make a segregation between those two kind of LSP's and see if their perspectives differ on implementation of PI characteristics in urban freight logistics.

Based on the exploratory research and interviews a list of LSP's is established per category, conventional LSPs and urban LSPs.

Logistics Service Providers:

Established logistics service providers

- DPD
- PostNL
- Peter Appel Transport
- Cornelissen Transport

- Netwerk Benelux
- Bode-Scholten
- UPS
- FedEx
- DLG
- Euser
- DSV
- HAVI Logistics

Urban Logistics service providers

- Cityhub
- Breytner
- PARCLS.COM

3.4.2 Municipalities

Municipalities are inherently related to urban freight distribution. A multitude of Dutch municipalities committed to a national Green Deal aiming towards emission free urban freight logistics in 2025 Government of the Netherlands (2018a). The local governments set the context for logistics operations in their cities by implementing legislation related to, for example, emission requirements and time windows. Municipalities work together with business to realize more sustainable urban freight logistics. This research includes multiple Dutch municipalities namely:

- Municipality of Amsterdam
- Municipality of the Hague
- Municipality of Rotterdam
- Municipality of Utrecht
- Municipality of Leiden
- Municipality of Zaanstad
- Municipality of Zwolle
- Municipality of Enschede

All of those municipalities have the intention to make their urban freight logistics more sustainable e.g. (Gemeente Amsterdam, 2015) (Gemeente Delft, 2016) (Gemeente Den Haag, 2018) (City of Rotterdam, 2019) (Gemeente Utrecht, 2017). The goal of this is mostly to realize a better air quality and reduce inner city congestion. Some cities, like Amsterdam, also have specific problems like the damage done to quay walls of the canals by heavy motorized vehicles. All the named cities try to realize this by working together with businesses and branch organizations. Getting to zero emission urban freight logistics has to be done by changing the current motorized fleet. But, municipalities want more efficiency in urban freight logistics as well since they are aware of the current low load factors.

3.4.3 Branch organizations

As discussed in section 3.4.2 branch organizations often take part in covenants between local governments and the industry. Branch organizations play an important role in promoting the interests of the sector. There are two big branch organizations representing the logistics sector in the Netherlands.

- evofenedex

- Transport en Logistiek Nederland (TLN)

Both of these organizations support the move to more sustainable urban freight logistics but want to ensure a sustainable economic environment for the sector as well. Since they represent the entire sector it is would be interesting to see if their perspectives are in line with the perspectives of the logistics service providers. Earlier research proves that it can be the case that differences can be found (Van Duin et al., 2018).

3.4.4 Gathering participants

According to Webler et al. (2009) there are two ways to get in touch with participants, snowball sampling and familiar people. Snowball sampling means that a participant is asked to deliver another participant for the Q-survey. In this research most of the municipalities were contacted via the network of AT Osborne. Besides that, connections from the TU Delft helped as well.

By practicing some 'snowball sampling' the Q-survey ended up in email groups of SPES (SPES, 2018) and CILOLAB (TNO, 2019). Besides that, attending several webinars about urban logistics and logistics in general was really helpful to get in touch with the stakeholders. This also resulted in some reactions from stakeholders that were not in my stakeholder set beforehand. After analyzing their value for the perspectives it was decided to include these in the results as well. The following stakeholders were added:

- Ministry of I&W
- Province of Brabant
- GS1

GS1 is a company that works on standardization of electronic communication. They are involved the living lab for sustainable urban freight logistics (TNO, 2019) and cooperate with the Eco2City initiative (GS1, 2018). The combination of knowledge on urban freight logistics and the fact that their solutions can help enable asset sharing makes GS1 an interesting actor in this research.

It was a challenge to get to all the stakeholders that were picked beforehand. Most of them filled out the Q-survey but other ones had to be replaced with different participants from the same stakeholder group. In the end an 28 participants were found for this research which proved to be sufficient to extract significant perspectives. The distribution of different actors in this research is displayed in figure 3.2.

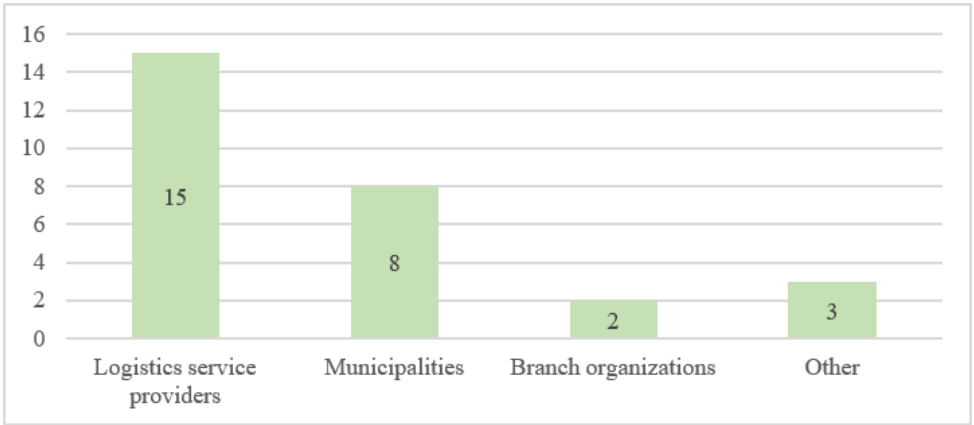

Figure 3.2: Histogram of actors represented in this research

3.5 Q-SORT

In Q-methodology the participants can be forced to place the statements from the Q-set in a grid. The vertical axis represents the grade of agreements with the statement. In this research this axis spans from 4, agree the most with, to -4, disagree the most with. To every grade of agreement on the horizontal axis of the grid an amount of empty boxes is assigned. These boxes must be used for placing the statements. This amount of boxes in finite and differs per degree of agreement. The more extreme grades present a relatively small amount of options while the more neutral grades are present in a relatively big amount. A grid like this shows similarities to the normal distribution. The grid that is used is presented in figure 3.3.

-4	-3	-2	-1	0	1	2	3	4
15	34	33	32	2	9	24	16	31
25	13	23	3	12	1	4	28	30
	18	7	6	5	14	22	19	
		21	10	26	11	17		
			8	29	27			
				20				

Figure 3.3: An example of a filled out grid used for the q-survey, the numbers represent statements. (KADE v1.2.0)

Due to the fact that participants are forced to place all the statements in a structured grid they have to make trade-offs between them. When designing a q-sort it is important to look at the differences between options on the y-axis (statements) and on the x-axis (grades) assuming a fixed amount of statements. When the x-axis (grades) is reduced compared to the y-axis (statements) more statements can be assigned to the same grade and there is less room for extreme opinions. It can be useful to do this when it is expected that a lot participants are indecisive to a substantial amount of statements from the Q-set. In this situation the aim of the research is for the participants to pick a few statements that are most important to them. On the contrary, the options on the y-axis (statements) can be reduced compared to the options on the x-axis (grades). In this way there is a lot of room for participants to express their opinions on a greater amount of statements. (Exel and de Graaf, 2005)

In this research it was chosen to work with a balanced grid since it was expected that the participants had both knowledge of - and an opinion about - most of the statements. To explain the research and clarify the statements a video was made for the participants and added to the survey (appendix D). The survey consisted of the following 4 steps:

1. Introduction video and overview of all the statements
2. Rank the statements: Agree, neutral or disagree
3. Rank the statements: Q-grid (figure 3.3)
4. Comment on most extreme ranked statements (4 and -4)

It can feel complicated to ask participants for their meaning is this format. It takes some time to sort all the statements so quite some dedication is asked from the participant. Bases on the information of my supervisors that had experience with this method this is not a problem.

Besides that there is some technical difficulty as well and most of the people do not have experience with filling out a survey this way. That is why a brief explanation was included in the video. Besides that, together with each step there was a textual instruction as well. To see if the survey was filled out seriously and understood correctly the following checks were carried out.

1. Check the time spend per question
2. Check if their explanation of the extreme ranked statements matches with the positive or negative placement of the corresponding statement
3. Check their feedback on the survey
4. Check the validity by asking feedback on the perspective they loaded on the most (this is carried out after the Q-analysis.

After all the participants filled out their Q-sort the first three checks were carried out on the results. From the 31 filled out Q-sort 2 had to be discarded which left 29 Q-sort for the analysis.

Most of the participants understood the purpose of the research and found out the correct way to answer the Q-survey. Two participants gave feedback that they were not able to fill it out due to the controversial nature of the statements in the Q-set. After a call they both got a better idea of the purpose of the research and were able to fill it out anyway.

3.6 Q-ANALYSIS

After all the participants went trough the four steps in the q-sort phase the results can be analysed. By looking at correlations between filled out q-sorts different perspectives on the subject can be revealed. Participants can 'load' on a certain factor based on the correlations between that factor and their q-sort. The factor represents a perspective and is represented with a newly created corresponding q-sort that belongs to the average perspective of all the participants that are coupled to that factor.

3.6.1 Factor analysis

A factor analysis consists of different steps. First the Q-sorts are checked on correlation and a principal component analysis is carried out. This analysis extracts 8 factors that can later represent different perspectives on the subject. After this the solution is mathematically rotated in such a way that the factors explains the most variance. However, not all those 8 factors are kept for the final solution. By using rules, guidelines and interpretation the optimal amount of factors is extracted.

3.6.2 Guidelines for determination of the number of factors to extract

At the start of the factor analysis a principal component analysis is executed. This analysis extracts 8 factors and calculates their corresponding eigenvalues and explained variance (figure 4.2). This is the first information that is valuable for determining how many factors to keep for the final solution. There are certain objective rules that can be used for this:

- The factor should minimally explain between 35% and 40% (Watts and Stenner, 2012)
- Factor eigenvalues should be larger than 1 (Webler et al., 2009)
- There should be at least two different Q-sorts representing a factor (Suprapto, 2016)

However, Webler et al. (2009) state that there is no objective number on how many factors there should be extracted. Every new factor will give some extra information but it depends per situation how useful that information is.

Since there is no objective way to determine the amount of factors that should be extracted the rules mentioned before can also be used as guidelines, if one is violated this does not have to be a problem. Besides those rules Webler et al. (2009) provide a number of guidelines to make this decision, these are the following:

1. Simplicity - fewer factors is better because it makes interpretation more easy. This should not be taken too far since useful information can be lost.
2. Clarity - The best factor solution aims for high loads on a single factor instead of multiple factors.
3. Distinctness - The correlation between factors should be as low as possible. If there are correlations this does not have be problematic since these shared opinions can be explained as well.
4. Stability - Also with different factor solution participants with similar views should be mostly clustered together.

(Webler et al., 2009) gives an indication on how many factors to extract from the Q-sort based on the amount of participants and statements. This meant in the case of this research 3 or 4 factors needed to be extracted. To arrive at a final number of factors both the objective quantitative rules and the qualitative guidelines are used. If this proves to be inconclusive the factor solution will be interpreted based on their qualitative explained value. These steps are visualized in a list below:

1. Does the factor solution meet the objective quantitative rules?
2. How does the factor solution rank on the qualitative guidelines?
3. Does the factor solution add enough qualitative explained value?

To compare the different factor solutions for all of them varimax rotation was applied. This method was also used on the final solution since it is often appointed the preferred option, there is little reason to prefer another system (Watts and Stenner, 2005).

4 RESULTS

In this chapter, the results from the factor analysis are assessed and interpreted. The goal is to determine how many factors to extract and to understand what these different extracted factors from the Q-analysis (section 3.6) mean.

In the first section (4.1) the guidelines, that are presented in section 3.6.2, are used to the determine the number of factors to extract. After that, in section 4.2, it is explained which data from the Q-analysis is important and how that information from the Q-analysis can be used to interpret the factors. This interpretation of factors is done subsequently (section 4.3), providing all the factors with a matching perspective and their relation to PI. In the last section of this chapter, all perspectives are analysed with respect to each other.

4.1 DETERMINING THE NUMBER OF FACTORS TO EXTRACT

To make sure no information was left out a 3, 4, 5 and 6 factor solution were checked on usability. Checking these factor solutions was based on eigenvalues (figure 4.1) where it can be seen that there is a drop between factor 4 and 5, and after factor 7. At first the 5 and 6 factor solutions are analyzed with the guidelines.

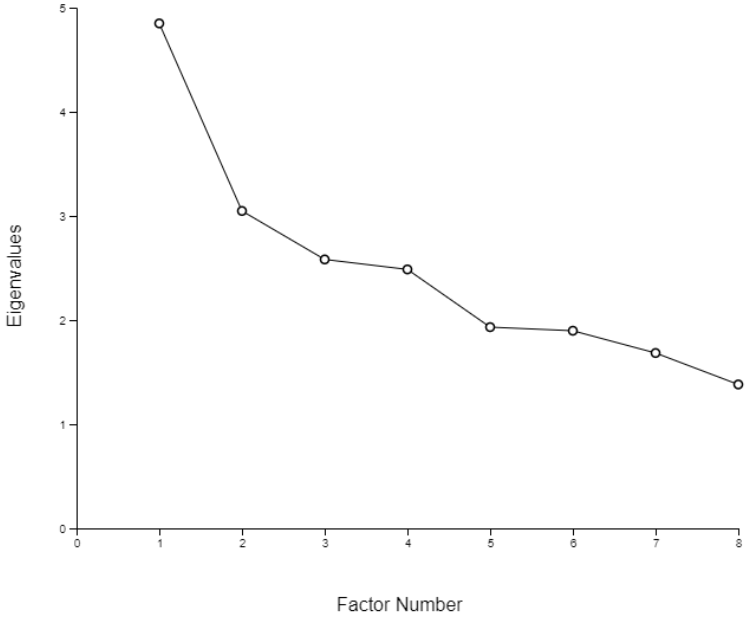

Figure 4.1: Scree plot, eigenvalues in relation to the number of factors (KADE v1.2.0)

If a solution with 5 or 6 factors is extracted it is does not necessarily passes for simplicity. Especially since a 3 or 4 factor solution is recommended in this case (Webler et al., 2009). But, according to the rules that were named before they are sufficient for analysis (Watts and Stenner, 2012) (Webler et al., 2009) (Suprapto, 2016). They both have an explained variance of over 35%-40%, all eigenvalues are larger than 1 and at least three participants are representing each factor.

Going back to the guidelines of Webler et al. (2009), in contradiction to simplicity, both the 5 and 6 factor solution rank well on the rest of the guidelines. The majority of participants only loads on one factor (clarity), the correlations between factors are low (distinctness) and the grouping of participants roughly stays the same on different solutions (stability).

Since the solutions were still able to meet the criteria interpretation had to be done on these solutions as well. This is where both of the solutions started to become less interesting. Due to the relatively high number of factors the number of significantly distinguishing statements reduced by a fair amount, at some factors to just three. This makes interpretation of the factors a lot more difficult. Also, these interpretations would only be applying to a small (mostly 3) number of participants. Due to this it was chosen to extract less than 5 factors for the final solution.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Eigenvalues	4.8487	3.0477	2.5822	2.4864	1.9321	1.8974
% explained variance	17	11	9	9	7	7
cumulative % explained variance	17	28	37	46	53	60

Figure 4.2: Factors with corresponding eigenvalues and explained variance (KADE v1.2.0)

This conclusion has left the 3 and the 4 factor solution, they both qualify for the objective quantitative rules but the 3 factor solution only reaches 37% of explained variance which is relatively low compared to the other factor solutions (figure 4.2). Further, their eigenvalues are all above 1 and over three participants are representing each factor.

The next step is to see how the factor solutions rank on the qualitative guidelines of Webler et al. (2009). They both score well on simplicity, the 3 factor solution inherently better. Both the 3 and 4 factor solution show a bit of correlation between 2 factors but this is not problematic. There is also no abundance of factors loading on multiple factors. In the 3 factor solution some participants load on a different factor than in the other factor solution, this also accounts for the 4 factor solution but to a lesser extent.

Also in this case the first two steps of the analysis prove to be indecisive. Looking at the qualitative value of both of the factors it can be seen that the three factor solution provides a high number of significantly distinguishing statements among all factors. With the 4 factor solution the 4th factor shows a lower number of distinguishing statements but it is not problematically low. Something that can be seen as problematic is that in the 3 factor solution some extremely rated statements contradict each other within one factor. This means that one participant extremely disagrees with certain statement but the overall composite Q-sort extremely agrees with that certain statement. This causes a problem with interpretation of the factor. Consequently, the 4 factor solution was chosen for analysis. The results from this analysis can be found in the next chapter.

4.2 IDENTIFYING THE MEANING OF THE FACTORS

To identify the meaning of the factors, the quantitative information following from the factor analysis has to be translated to a qualitative perspective. The different outcomes listed below are important to asses when constructing the perspectives. They can all add value to the overall perspective.

- Significantly distinguishing statements per factor (appendix C.4)
- Extremely ranked statements per factor (appendix C.3)
- Overall consensus-disagreement on statements and correlation between factors (appendix C.5)
- Feedback on choices made by participants (qualitative)

The distinguishing statements per factor represent the statements that differ significantly from the other perspectives, and are therefore very important to pinpoint the differences between factors (Webler et al., 2009). Whether a statement is ranked the highest or the lowest in a certain factor compared to the other factors is also checked. Mostly, these significant statements end up on the more extreme side of the spectrum. Not all the statements with high or low ranks are significantly different from other factors, but they do provide information about the factor perspective. This is why it is relevant to take these statements into account. Another good starting point is to analyse on which statements the factors agree with each other, shown by a low variance between scores per factor.

In section 4.3 the perspective for each factor is presented, based on the different outcomes from the Q-analysis listed earlier in this section. These perspectives strongly relate to urban freight logistics and characteristics of PI. To highlight PI characteristics, a subsection is added where the perspectives on those characteristics are explained. The subsequent subsection discusses the participants belonging to each factor and what that means for the perspective.

4.3 THE PERSPECTIVES BELONGING TO THE FACTORS

4.3.1 Perspective 1 - Trust in an open platform and standardization of loading units to make urban freight logistics more sustainable, realistic regulation needed to set boundaries

It stands out that under this perspective participants are on average very positive about the standardization of smaller loading units. In addition, it is being thought that the future of the logistics sector will be based on sharing assets, whilst there is also room for maintaining relationships with the customer.

The latter situation will improve the quality of life in urban areas, because in general, contemporary city logistics still causes many negative externalities. An increasing amount of logistics service providers are ready to share data and a governmental organisation does therefore not have to oblige this. An important note is the data will have to be thoroughly understood, which in turn creates another challenge.

Next to the area of data sharing, there is room for more regulations in city logistics, for example in relation to zero emissions in 2025. It is expected that the pressure on urban public space will increase even further, making sustainability a must with regulation as a result. Yet, the awareness of this being a very big challenge also creates understanding for postponement of specific restrictions.

Quotes

Municipality of Zwolle

"If small loading units are standardized, it may be easier to use other types of vehicles, such as cargo bikes, etc. In that case, there is no need for a van in the city center, but it can be even more sustainable."

DPD

"40 Zero emission zones by 2025 is a major challenge."

Municipality of Amsterdam

"The number of logistics movements is expected to continue to increase in the coming years. On the other hand, the (inner) cities are getting full. And public space will become even more valuable, just think of limiting the number of parking spaces in the city center, for example, or multifunctional use of public space throughout the day. And sustainability plays an increasingly important role. Where this is also increasingly seen as a 'must' with regulation as a result. This requires a way in which providers are (required) more efficient and need each other, because they do not (always) own all the 'tools'."

Peter Appel

"Meanwhile, most LSPs are connected to smart systems that collect and record data. The art of sharing is more in understanding that data and increasing its reliability."

Perspective 1 in relation to the PI characteristics

In table 4.1 the distinguishing and extreme statements belonging to factor 1 are depicted. The list is reduced for readability reasons, meaning all the distinguishing statements scoring -1,0 or 1 are left out, these can be found in table C.6. Moreover, links to the relevant characteristic and dimension are added for each statement. The characteristics indicate what has, or has no, potential for making urban freight logistics more sustainable.

As previously stated, this perspective stands positive towards the standardization of loading units. Three of their positive distinguishing factors relate to this characteristic which makes it stand out. That an open platform can be the future of logistics is also ranked positively and applies to the standardization of collaboration protocols. The fear of an open platform having a negative effect on urban livability is ranked extremely low, indicating that an open platform is deemed very promising in this

perspective. However, one of the participants noted that an open platform may allow for monopolies to form, which should be taken into account.

Table 4.1: Reduced set of distinguishing and extreme statements belonging to factor 1 (** p<0.01, * p<0.05)

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,71	4	31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Stand. Cont.	Logistics
	1,621	4	16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	General	Logistics
**	1,56	3	28	Size standardization of smaller loading units will accelerate the sharing of assets.	Stand. Cont.	Logistics
	1,464	3	24	An open platform where logistics service demand and supply meet will be the future of logistics.	Stand. Coll.	Logistics
**	1,41	3	30	Standardization of smaller loading units should be introduced by a governmental organization.	Stand. Cont.	Market
**	-0,6	-2	8	Most logistics companies are not digitally ready for data sharing while they should be.	Data sharing	Data
**	-1,06	-2	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics
**	-1,09	-3	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data
**	-1,51	-3	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	General	Societal
	-1,608	-3	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
**	-1,74	-4	18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	General	Market
	-1,856	-4	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal

The nature of the stakeholders in this perspective

This perspective is represented by six participants, which is one more than in the other perspectives. In this perspective, both logistics service providers and municipalities (Amsterdam and Zwolle) are represented. Three of the logistics service providers mainly handle parcels (PostNL, DPD and PARCLS.com) and one of them offers a wider range of logistics services (Peter Appel).

The presence of parcel handlers can explain the positive view on standardization of small loading units, although other participants representing this perspective also stood positively towards this. The

composition of these participant sorts causes that the perspective says that regulation around the Green Deal should maybe be postponed without all participants indicating to want this.

4.3.2 Perspective 2 - It is already possible to work very efficient, moderately negative towards PI characteristics and governmental influence should be limited

What stands out in this perspective is that statements related to government regulation have on average been assessed negatively. The government does not have to oblige data sharing nor has provide a platform for it. In addition, no disruptive innovation is required to make companies share data on an open platform. Furthermore, this perspective argues that it is difficult to maintain the current relationship with customers and that the distribution of costs and benefits is very complicated too.

The current state of affairs actually shows that there are already possibilities for sharing data and assets. Logistics service providers - even the smaller ones - should therefore derive more of their competitive advantage from this, because there are still too few of them bringing it into practice. An example of this is cooperating by sharing distribution centers to serve urban areas in a more sustainable way.

This second perspective has two views with regard to the postponement of certain restrictions around the ZE zones in 2025. On one hand, postponement seems necessary due to the correct means not yet being available. On the other hand, strict deadlines are required to enforce change. When adhering to the deadline, companies must be helped through stimulus measures.

Quotes

Network Benelux

"The government is often too slow and too complex in relation to the market."

Bode-Scholten

"Government should not interfere with this. Stop subsidy schemes because if they run out of money, the initiative stops."

Breytner

"The transport and logistics industry is very accessible and is characterized in particular by competition on price. Low professionalization ensures that sharing of information is seen as a threat."

Municipality of The Hague

On difficulty dividing costs and benefits accordingly - *"This uncertainty has a serious negative effect on trust between companies."*

Perspective 2 in relation to the PI characteristics

Table 4.2 shows that a lot of the highly ranked statements correspond with asset sharing. From this perspective it becomes clear that asset sharing is important for sustainable urban freight transport, yet this should not be realized in an open system like PI proposes. It is argued that asset sharing can be realized with the current data formats and there were no strong opinions on loading unit standardization. This perspective tells that a lot is possible already, therefore no need exists for governmental organizations facilitating a new platform or obligating types of behaviour. Thus, this perspective stands positive towards asset sharing and data sharing, but the latter does not have to happen in a PI like system.

The nature of the stakeholders in this perspective

Perspective 2 also represents participants of various natures. Firstly, it embodies two logistics service providers (Netwerk Benelux and Bode-Scholten). These particular companies already try to consolidate freight from many origins in order to deliver efficiently, resulting in the negative attitude towards regulation and (forced) innovation.

Besides, this factor is represented by another logistics service provider (Breytner) and a municipality (Den Haag). While they do not agree with the negative attitude towards regulation, they do agree on

the fact that a lot is possible already and that this does not have to be accelerated by, for example, a disruptive innovation. This also explains the last part of the perspective description where the ambiguity towards regulation shows.

Table 4.2: Reduced set of distinguishing and extreme statements belonging to factor 2 (** p<0.01, * p<0.05)

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,72	4	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
**	1,61	4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics
	1,298	3	8	Most logistics companies are not digitally ready for data sharing while they should be.	Data sharing	Data
	1,177	3	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Asset sharing	Logistics
	1,166	3	4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	Asset sharing	Market
*	1,13	2	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	General	Societal
**	1,11	2	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	General	Societal
*	-0,82	-2	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	General	Market
**	-1,11	-3	6	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	Asset sharing	Market
	-1,143	-3	10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	Data sharing	Data
**	-1,77	-3	11	A disruption in the logistics sector is needed to make companies share their data.	Data sharing	Data
**	-1,99	-4	22	A governmental organization should be in charge of a standardized data sharing platform.	Stand. Coll.	Market
**	-2,31	-4	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data

4.3.3 Perspective 3 - Zero emission is important but operations should primarily become more efficient, asset sharing and data standardization are promising to achieve this

In this perspective, great importance is attached to increasing efficiency, which will have even more positive impact on the liveability of urban areas than changing to ZE vehicles. This positive impact is necessary because the current situation entails many negative externalities. This is mainly because there are many shippers and receivers who carry out their own transport because they do not experience this as an extra cost.

The standardization of data formats is currently not sufficient to adequately share assets and an open system could provide a solution. Current customer relationships and specific services provided will not be lost by this system. This open platform will ensure better competition, which will also lead to higher efficiency.

The logistics sector can be stimulated more to become more efficient and therefore certain measures surrounding the Green Deal: ZES should not be postponed. Ultimately, innovation will have to come from the sector, but the government must set certain limits and encourage good initiatives.

Quotes

Municipality of Rotterdam

"If the operational quality of the system for sharing assets is at least at the same level as in the current situation, the customer will notice no difference on this point, at most an improvement. The customer relationship (and therefore the distinctive character compared to competitors) will have a different content, but it can still be strong."

GS1

"The delivery addresses often have no specific requirements at all for the assets (boxes / pallets / trolleys) with which the goods are delivered. Smaller locations in particular (which are most deliveries) often make few / no requirements as long as the assets are also quickly collected (people often have little space to store the assets temporarily)."

Municipality of Zaanstad

"Quality of life in the city consists of so much more than emissions. If the transition to zero emissions means: a diesel truck that will be replaced by an electric truck, but everything else remains the same, then you will have no emissions and less noise, but you may still have more freight traffic than necessary or the area can handle. In a bad case (greater own weight of electric vehicles, less payload left) you even have more vehicles."

FedEx

"Many different shippers in one city cause many kilometers driven and congestion because different vehicles drive through the same streets and call at the same addresses."

Municipality of Utrecht

"I agree, because just replacing a combustion engine vehicle to an electric motor will continue to drive the same number of vehicles on the road. Zero emissions must, but only in combination with bundling of goods and transition to other vehicles and vessels (such as LEVVs and over water)."

Perspective 3 in relation to the PI characteristics

This perspective states the importance of efficiency in urban freight logistics. It is expected that this has even more positive impact on urban livability than changing to zero emission vehicles (table 4.3). An open platform where logistics supply and demand meet can be a means to achieve a higher efficiency. This could be an incentive for shippers (that carry out their own transport) to outsource their logistics needs. Data formats have to change because the current ones are not sufficient for asset sharing. Besides that, also in a new system client relation can be apprehended but based on the qualitative criteria of

the new system. Overall this perspective is positive about the open system and standardization the PI concept proposes since efficiency is highly valued.

Table 4.3: Reduced set of distinguishing and extreme statements belonging to factor 3 (** p<0.01, * p<0.05)

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,9	4	3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Asset sharing	Societal
	1,695	4	16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	General	Logistics
	1,203	3	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
*	1,01	3	17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	General	Market
	0,999	3	26	An open platform for asset sharing causes better competition instead of forming a monopoly.	Stand. Coll.	Market
**	0,87	2	27	Difference in data formats on loading units is currently a major barrier to asset sharing.	Stand. Cont.	Data
*	-1,04	-2	5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	Asset sharing	Societal
	-1,352	-3	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	General	Societal
**	-1,39	-3	1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Asset sharing	Logistics
	-1,473	-3	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
**	-1,54	-4	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
**	-1,83	-4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics

The nature of the stakeholders in this perspective

Again, just as the previous perspectives, different kinds of participants represent this perspective. The three municipalities (Rotterdam, Zaanstad and Utrecht) all state that just changing a vehicle to an electric one is not going to solve the unsustainabilities caused by urban freight logistics. Besides

emissions there is so much more that has effect on city liveability. The logistics service provider (FedEx) in this perspective from own experience that there are many different logistics service providers that call in the same street every day, this can be done more efficient. And then there is one 'stranger in our midst', a company that works on standardization of electronic communication (GS1). Due to a mail to CILOLAB (TNO, 2019) this arrived at this company but their perspective was actually valuable to take into account as well. In line with their core business they think standardization can work for urban freight logistics since, e.g. there are not so many specific requirements as you would think.

4.3.4 Perspective 4 - An open platform will bring more efficiency to urban freight logistics, city hubs will still be needed together with regulation and stimulation

This perspective clearly shows that a lot can still be done to make city logistics more sustainable. Regulations around ZE zones are important and the Green Deal: ZES is preferably not partially postponed. More regulation around city logistics is well conceivable, for example with regard to the sharing of data, which will have to be coordinated nationally. The market itself has insufficient interest in matters such as sustainability and quality of life. But regulation is not as easy as it might seem, regulation is a big challenge for municipalities.

An open platform where supply and demand can be matched is promising and could be the future of the logistics sector. Small LSPs will also be able to continue to participate in this system and there is still room for this group when a ZE zone is introduced. It can be difficult to maintain the same relationship with the customer with this new way of working, and the fear of sharing competitively sensitive information can also cause problems.

In this future, the city hub will also play an important role in ensuring sustainable and efficient city logistics. However, there should be an incentive to use it, if it is just as expensive for the customer to have it delivered to the door as it is at the hub no one is going to use it (Appendix C.8).

Quotes

Municipality of Enschede

"The market itself has insufficient interest in matters such as sustainability and liveability."

CityHub

"Without this matching of supply and demand, the number of transport movements in the city will increase enormously. Even if that becomes zero emission (which is poorly affordable for many actors), it becomes way more expensive due to poorer accessibility and more traffic. Innovation in this area is necessary to keep it affordable. Not all players (especially the big ones) will be ready for this, so it has to be disruptive."

Province of Noord-Brabant

"Regulation is a bigger challenge for municipalities than you would think, because the subject requires an integrated approach by municipalities and the legal means to get it done in a municipality are more limited than you would think. In addition, it is also a question of feeling the need for shipper and receiver: is one willing to pay the same price with perhaps a different delivery agreement than one is used to? City logistics may be efficient in some areas for each type of logistics (store delivery, construction, facilities, waste), but often there is no common approach or view, so it is fragmented."

Euser

"There will have to be a realization that if you want your goods delivered to the door, there is a price tag attached to this. A good example in Amsterdam was from suppliers of building materials that there is no difference in delivery costs to a construction hub on the outskirts of the city or delivery on the canal in the center .... "

Perspective 4 in relation to the PI characteristics

This perspective is very positive with regards to an open platform for matching logistics service demand an supply. It is going to cause better competition, smaller companies will not be excluded and is going to increase city liveability, this open system will be the future of the logistics sector. In contrast, this perspective is not very distinct with regards to loading unit standardization. Most statements regarding this characteristic are ranked neutrally. The one thing it does say about this is that the standardization of loading units is not a task for a governmental organization. Concluding, this perspective is in favour of an open system that matches logistics service supply and demand but is not very outspoken on the other characteristics of PI.

Table 4.4: Reduced set of distinguishing and extreme statements belonging to factor 4 (** p<0.01, * p<0.05)

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
	1,682	4	19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	General	Societal
	1,669	4	24	An open platform where logistics service demand and supply meet will be the future of logistics.	Stand. Coll.	Logistics
	1,568	3	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data
	1,198	3	20	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	General	Logistics
	1,016	3	26	An open platform for asset sharing causes better competition instead of forming a monopoly.	Standard Coll.	Market
*	-0,69	-2	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Asset sharing	Logistics
**	-1,25	-2	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
	-1,573	-3	30	Standardization of smaller loading units should be introduced by a governmental organization.	Stand. Cont.	Market
	-1,601	-3	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal
**	-1,64	-3	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	General	Market
	-1,919	-4	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
*	-1,93	-4	23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	Stand. Coll.	Market

The nature of the stakeholders in this perspective

In this perspective, the natures of participants representing the factor differ too. One logistics service providers specifically aims on urban freight logistics by providing last mile transport from a hub at the outskirts of the city (CityHub). This is one of the reasons that a hub is seen as a part of the solution in this perspective. The other logistics service providers (Euser and DLG) do not only work on urban freight logistics and provide a wider spectrum of services. There is also one municipality (Enschede)

representing this perspective that thinks that the market inherently does not take city liveability into account as much as it should. A logistics program manager from the province of Brabant also filled out the Q-survey. This stakeholder was not in the P-set but added value to the perspectives so it was taken into account. The province of Brabant proved to have a lot of knowledge about municipality policy making with regards to urban freight logistics.

4.4 THE SIMILARITIES AND DIFFERENCES BETWEEN ALL THE PERSPECTIVES

This section summarizes all the different perspectives by looking at similarities and differences between them. By doing so, the overall consensus per perspective, their corresponding vision on the PI characteristics, and the participants representing the factor will be taken into account. Then, an overall consensus between the participants is presented. The goal is to understand the differences between perspectives and see on which points they actually agree with each other.

1. Trust in an open platform and standardization of loading units to make urban freight logistics more sustainable, realistic regulation needed to set boundaries
2. It is already possible to work very efficient, moderately negative towards PI characteristics and governmental influence should be limited
3. Zero emission is important but operations should primarily become more efficient, asset sharing and data standardization are promising to achieve this
4. An open platform will bring more efficiency to urban freight logistics and city hubs will still be needed together with regulation and stimulation

When looking at the differences between perspectives, it stands out that perspective 2 differs most from the others. This became clear after assessing the distinguishing and extreme ranked statements for each factor. The difference between perspective 2 and the other perspectives (1,3 and 4) can also be seen in figure 4.3 where the correlations between factors are depicted. Three different types of correlations can be distinguished:

1. A positive correlation between factors means that statements were ranked similarly to a certain extent.
2. A correlation between factors that approaches zero means that statements were ranked differently in those factors.
3. A negative correlation between factors means that statements were ranked oppositely to a certain extent.

Factor 1,3 and 4 correlate with each other to a certain extent, which was also noticed when assessing the distinguishing and extreme ranked statements. Factor 2 shows low and negative correlations with the other factors which means that statements were ranked different or opposite in relation to the other factors.

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1	-0.1122	0.2381	0.2704
Factor 2	-0.1122	1	-0.0779	-0.0024
Factor 3	0.2381	-0.0779	1	0.3498
Factor 4	0.2704	-0.0024	0.3498	1

Figure 4.3: Correlations between the different factors (KADE v1.2.0)

To depict what these differences and similarities look like, the distinguishing statements from factor 2 (table 4.2) are assessed and related to factor 1,3 and 4. These statements show that a lot can be done already in the current situation, and that the situation might not be as bad as it is sometimes presented. A open platform would not be satisfying, since this would unable LSPs to maintain strong relations with their clients. Through 'normal' collaboration between parties a lot can be achieved, thereby potentially making dedicated urban consolidation centres unnecessary. Zero emission zones might cause extra vehicle kilometers and postponing certain regulations related to this might not be a bad idea. Besides, municipalities should not regulate urban freight too much. Yet, when they do, it should be coordinated nationally.

The above contradicts to the other perspectives, which see potential in an open platform and want the municipalities to set boundaries to urban freight logistics. A zero emission zone is a good idea yet only part of the solution and regulations around this should only be postponed when really necessary. Perspective 1,3 and 4 all state that PI characteristics have great potential in making urban freight logistics more sustainable.

However, as depicted in figure 6.1 perspective 1,3 and 4 correlate but they also show differences. These differences mainly exist on topics like regulation, promising PI characteristics, and the results that are perceived as important. Perspective 4 believes in regulations to accelerate change, which is to a lesser extent agreed on by perspectives 1 and 3. Perspective 1 could live with a delay of certain ZE regulation and perspective 3 does not want too much governmental influence, stating that regulation should only draw the boundaries. All three perspectives see the benefits of an open platform, but different PI characteristics are deemed promising. Where perspective 1 likes the idea of a standardized loading unit, perspective 3 likes the idea of standardized data formats. In perspective 4 the relevance of asset sharing in urban freight logistics is underlined, which is in line with PI characteristics. Perspective 3 and 4 do not think that changing to ZE vehicles is sufficient; they state that extra efficiency is badly needed in order to improve city livability. Perspective 3 finds this even more important than changing to ZE, while perspective 1 finds prioritizes ZE over efficiency in relation to effects of city livability.

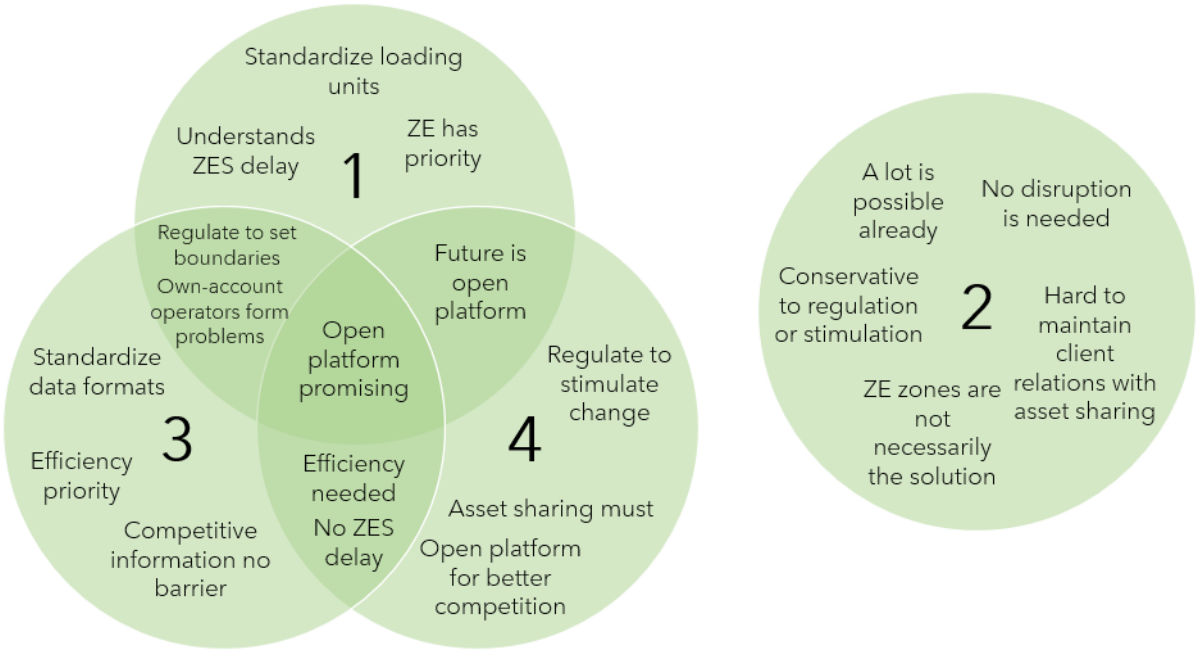

Figure 4.4: Similarities and differences between all the perspectives (van Son, 2020)

4.4.1 What participant representation tells and where the branch organizations have gone

All perspectives are represented by both municipalities and logistics service providers, and some can be related to their own operations. This can be seen in perspective 1 - where standardization of loading units is found interesting by parcel handlers - and in perspective 2 - where LSPs that already facilitate load consolidation say a lot is possible already. The fact that municipalities or LSPs do not group at certain factors makes it difficult to couple various perspectives to these groups.

What can be stated is that municipalities generally do not have a negative attitude towards regulation. This might not be surprising, yet value can be derived from validation. While one municipality represents perspective 2, being quite negative towards regulation, the textual answers in the survey show that this municipality does fit the perspective yet to a lesser extent agrees on the perspective's attitude towards regulation.

One group of stakeholders is missing in all perspectives: the branch organizations. They did not load significantly on any of the factors since they loaded high on 2 different ones (table C.2). Since their

function expects them to represent multiple perspectives, this can be seen as quite applicable. One of the organizations (TLN) ranks between perspective 2 and 3 and argues that some things can be done already yet a lot still has to change.

4.4.2 The overall perspective

What is shown in table 4.5 can be seen as a sort of single factor solution. It is not common to look at the average ranks on statements from all the Q-sorts in Q-methodology, nor is it representative for the entire P-set as a lot of actors do not significantly load on a single factor. Besides, some factor groups are more strongly represented than others which has a majorly disturbing effect on averages. However, in this case it gives a similar image as the majority of the different perspectives does.

That an open platform is going to be the future of logistics is ranked the highest on average. This corresponds with perspectives 1,3 and 4 which emphasize how promising this might be for the logistics sector. However, sharing assets can be hard as hidden costs could make fair assignment of costs and benefits difficult. Besides, most logistics companies are not ready to share data, even though they should be. They will be ready when there is a proven business model, as there is no clear financial incentive right now. Overall, it is not feared that smaller companies are going to be excluded due to a transition towards an open system or due to introduction of ZE zones. But, relationships will change in this open system where quality will be based of different criteria.

Table 4.5: Average ranks per statement ranked above 0,5 or below -0,5

#	Statements	Rank
24	An open platform where logistics service demand and supply meet will be the future of logistics.	1,31
19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	1,14
16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	1,03
4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	1,00
8	Most logistics companies are not digitally ready for data sharing while they should be.	1,00
28	Size standardization of smaller loading units will accelerate the sharing of assets.	0,79
31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	0,79
9	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.	0,76
2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	0,59
3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	0,55
10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	-0,55
5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	-0,79
21	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	-0,86
14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	-0,97
30	Standardization of smaller loading units should be introduced by a governmental organization.	-1,17
23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	-1,45
25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	-1,69
13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	-1,83

To get to more efficient and sustainable logistics, regulations are needed but they should be nationally coordinated. However, things like introducing standards are not conceived as a task for the government.

Change is much needed since the current state of urban freight logistics is ranked as an urgent problem. Currently, the biggest inefficiencies are caused by shippers and receivers taking care of their own transport. It might not be surprising that the latter ended up high in the ranks given that a lot of LSPs are represented. The single factor also states that efficiency is more important than ZE with regards to improving city livability.

Perspective 2 shows that a lot is possible already and that urban consolidation centres (UCC) are not the solution to current urban freight logistics unsustainabilities. By consolidating flows in different stages of the logistics chain (e.g. regional DC's) it is possible to achieve highly efficient operations which can already reduce urban freight logistics externalities by a fair amount. In the overall perspective it becomes clear that the UCC statement, about them being unnecessary when current DCs are shared, is ranked neutrally. It indicates that there are diverging thoughts on this topic. Although the UCC-concept is an old concept it still did not prove to be successful and that is also reflected in this outcome.

Most of the characteristics of the overall perspective represent a mix of perspective 1,3 and 4. It shows the elements they agree on but does not represent the differences between them. Perspective 2 is not represented by this summary since this perspective differs a lot from the others. This shows that grouping the participants with q-methodology was in this case really helpful in order to learn about different perspectives on a certain issue.

4.5 THE RESULTING PERSPECTIVES COMPARED TO THE LITERATURE

A lot of research has been done already on urban freight logistics and PI. In relation to PI, research concering stakeholders viewpoints has been done by Gasperlmair et al. (2016), Simmer et al. (2017) and (Ciprés and de la Cruz, 2019). In relation to urban freight logistics this has been done by, amongst others, Ballantyne et al. (2013), van Duin et al. (2016) and Van Duin et al. (2018). Further, Van Duin et al. (2018) researched the stakeholder perspective on urban consolidation centres by using the same survey method as applied in this research. In this section conclusions from these and some other reports are compared to the results.

Since Van Duin et al. (2018) conducted similar research according to the method and the research area the results are firstly compared to their results. One of the things that was concluded is that shippers were not negative towards regulation. In this research the same thing can be observed for LSPs and municipalities but it differs per perspective to what extent. One perspective sees regulation as something important to stimulate and change things (perspective 4) while the rest of the perspectives proposes a more moderate view and just wants regulations to set boundaries.

The 'solution oriented policies' perspective from Van Duin et al. (2018) sees similarities with perspective 4 in this research. The only difference is that in this research it is clearly not feared that smaller parties are going to be left out by new policies, such as the introduction of ZE zones.

In Van Duin et al. (2018) it also becomes clear that some shippers see that there is no room for all the freight movements in the city. In this research it especially becomes clear that in perspective 1,3 and 4 this view is widespread as well. The overall opinion does show that there is clearly work to do in urban freight logistics to make it more sustainable. This is also why shippers see advantages in efficiency improvement just as can be noticed in perspective 3 of this research.

Policies should be very clear and based on a long term vision since van Duin et al. (2016) concludes from interviews that 'the government seems the most dominant uncertainty factor for stakeholders in this field'. But to make adequate policies more information is needed about urban freight transport (Ballantyne et al., 2013). This perspective can also be found in textual explanation from municipalities in the Q-survey, by exchanging information between the market and municipalities improvements can be made on both ends.

According to Mervis (2014) regulators are going to play a big role in setting standards for the logistics sector, Ciprés and de la Cruz (2019) also state that regulations are going to be important. In this research it depends per perspective and per type of standardization what the role of the government on this should be. Perspective 4 feels something for regulation around data sharing as well but does not see a government taking a big role in developing these standards. Also the other perspectives do not see this role for the government when it comes to data sharing. Especially perspective 2 thinks that these kind of things should be left for the market to solve.

What stands out is that in perspective 1 a positive attitude prevails around loading unit standardization. They do even foresee a role for governmental organizations in the introduction of these standardization. But, according to Gasperlmair et al. (2016) freight forwarders are quite critical when in comes to a further standardization of loading units. Centre de Routage Collaboratif (2016) shows that also with the current loading units a lot of efficiency can be gained. This is consistent with perspective 2 where participants also address the possibilities that are already present.

In textual explanation of the survey and by the overall positively ranked statement - about data sharing and it only becoming interesting if there is an economic incentive - it was concluded that for PI like innovations proved business models are very important. From interviews with freight forwarders Gasperlmair et al. (2016) concluded that, in the end, it will all be about monetary gains if LSPs are going to collaborate or not. This is also supported by Ciprés and de la Cruz (2019) - that looked at the shippers perspective - who state the importance of feasible business models. According to Ciprés and de la Cruz (2019) PI will mean a paradigm shift and decision making will increasingly shift to the shippers. It is remarkable that, if this is the case, logistics service providers are mostly positive towards the introduction of PI characteristics. That LSPs can be positive about collaboration and sharing there assets was also concluded by Simmer et al. (2017) but this opinion was not unanimous. This also holds

for this research since in perspective 2 there is a clear sound of LSPs that are quite negative about PI characteristics. The interesting fact about the LSPs that represent perspective two is that they already try to be efficient by collaboration an Simmer et al. (2017) states that this is the fist step towards the PI vision.

Some reports believe that there is a need for pilots to prove business models in real life (Crainic and Montreuil, 2016). In this research that did not really come forward, especially perspective 2 is not a fan of subsidizing these kind of initiatives, when the project runs out of subsidy, the project stops. Another textual explanation on this described that pilots can be useful for technical feasibility but not for economical feasibility since it is hard to translate it to the real market.

Overall it can be said that a lot of the revealed perspectives find similarities to conclusions from earlier research but there are some differences as well. Since this methodology only looks at a small, unrepresentative, sample of stakeholders in the system it can not be translated to a population of some sort. But it is valuable to see how it compares to other research.

4.6 VALIDATING THE RESULTING PERSPECTIVES WITH THE PARTICIPANTS

To validate the perspectives that were drawn from the Q-survey results, they have been fed back to the participants (Ramlo, 2016). A group perspective does almost never fully correlate with the perspective of an individual participant because it is a conjunction of different, but similar, perspectives. The following questions were posed to the participants after presenting the explanation of the perspective in their participant group.

1. *To what extent does your own perspective link up with the presented perspective? (on a scale of 1-10)*
2. *Do you have any other comments regarding this perspective?*

Because the results of this study came in during summertime in the Netherlands, many of the participants were on holiday. This caused that most of the participants did not have a chance to give feedback on the perspectives linked to them. Luckily feedback was received from a participant for every perspective. The current results are depicted in the list below.

1. Trust in innovation, realistic regulation to set boundaries
   - DPD, 8, *"..less understanding to the postponement of specific restrictions."*
   - PARCLS.com, 9, *"It rarely happens with segmentations, but I can recognize myself to a very high degree in your profile. So I give it a 9."*
2. If there is a will, there already is a way
   - Bode-Scholten, 8
   - Breytner, 6, *"..The challenge in setting the frameworks (ZE zones or 0-emission standards) is that this must take place on the largest possible scale (EU) to create sufficient market potential for OEMs."*
3. Cleaner, but mostly more efficient
   - City of Utrecht, 9, *"Perspective matches for almost 100%; so 9.."*
   - GS1, 8, *I would say that the perspective gets a score of 8. I think that the relations between parties will change.*
4. Regulate, stimulate and innovate
   - DLG, 8
   - HAVI*, 7.5, *"..If regulations are clear, it will be easier to pass on price increases."*

* - *loaded to a perspective but not significantly ($p<0,01$)*

It can be concluded that overall the group perspectives link up well with the participants perspectives. Most perspectives were graded between a 7,5 and a 9, and one of them with a 6. The 6 was already expected and explained with the results. In this perspective there were some significant differences regarding the time pressure behind regulations.

5 IMPLEMENTATION

5.1 BARRIERS AND OPPORTUNITIES OBSERVED

One of the aims of this research was to define which characteristics of PI are found promising to make urban freight logistics more sustainable. As the results showed, the majority (1,3 and 4) of the perspectives has a generally positive attitude towards these characteristics. An open network is found promising in all of these three perspectives and divided over those perspectives the other characteristics are ranked positively as well.

Also the standardization of loading units and the standardization of data formats were named promising but both only in one perspective. The general opinion that can be distilled is that the consolidation of flows is the most important and that an open platform can help with achieving this. In this way demand and supply can be coupled which should make it easier to consolidate flows and increase the load factors.

One perspective (2) did not show the positive attitude towards the implementation of PI characteristics but there could be an explanation for that. The LSPs representing that factor state that they already work in a very collaborative and efficient way which shows that a lot is possible already. A major change to a new system does not seem to be needed in that situation. However, their attitude towards the PI characteristics was not entirely negative as well. Besides, collaborations are a first step to increasingly open supply network, and by that to the PI vision (Simmer et al., 2017).

The knowledge that perspectives 1,3 and 4 are generally positive towards PI characteristics is helpful but it does not explain why there are no widespread 'PI-like-networks' already. That is why the barriers and opportunities were distracted from the textual explanation with the Q-survey (appendix C.8). This resulted in the following list (table 6.1), the count provides information on the related perspective. If there is no count with the barrier this statement was part of the survey but not agreed on. If there is no count with the opportunity a solution was filled in from the literature.

Table 5.1: Named barriers to PI and corresponding opportunities

Barrier to PI	Count	Opportunity	Count
Open platform causes a monopoly	P1	Smaller parties can be better involved due to an open system. Open platform will cause healthy competition and more efficient operations.	P1, P2, P3, P4
LSPs are digitally not advanced enough	P4	Most LSPs do collect data but do not know what to do with it. An app could help with this issue.	P1
Fear of sharing competition sensitive information	P2, P4	This is not such a big deal in practice, collaboration is already needed to create advantages. Due to low level of professionalization caused by a market that is easy to join this fear exists.	P1, P2
Sharing costs and benefits accordingly	P1, P2	An open platform where logistics service demand and supply meet.	
Current networks suffice	P2, P4	Different data formats, also on loading units.	P2, P3
Transition costs to new system	P2, P3	Creating a need will make change worth it, this need will eventually come. A disruption can also accelerate this transition.	P3, P4, P4
Inability to maintain strong relations with asset sharing	P2	This is possible only the relations will be different based on different criteria.	P3, P3
Specific services cannot be provided with asset sharing		In practice there are little specific services, fast delivery or pick-up is most important.	P3

This shows that multiple barriers are still in place in relation to the PI characteristics. However, for most of these barriers opportunities are named as well. This means that these barriers might exist for some participants, but that for other participants these things are not experienced as barriers. There is one barrier without an opportunity attached to it. This barrier states that it is hard to allocate costs and benefits accordingly when sharing assets. In this research an open system was proposed where logistics service demand and supply could meet. In this system it is possible to make a price offer on certain demand which will make the sharing of costs and benefits more convenient. However, since this system is not here, it is clearly important to state that this is currently perceived as a barrier to asset sharing.

There is one more thing that stands out regarding the transition costs to the new system. There are opportunities named by participants but these are currently not here. The opportunities say that a certain 'need' has to come, that this will eventually come and that this might be accelerated by a disruption. But, still the barrier remains that there is currently no real need for some participants to make a change to a more efficient system. This might be a significant barrier to PI characteristics currently, there is no real need to invest in a transition. To deal with this there should be an 'environment where efficiency pays off' which gives the sector an incentive to get in action.

It should not be forgotten that time is an important aspect as well. A lot of LSPs are already working in collaborations and try to make their operations more efficient. Besides, the majority of perspectives shows that an open system is very promising and perspective 1 and 4 think it is the future of the logistics sector. But, transitions can take up a lot of time, so it might be coming but time is needed.

5.2 CREATING AN ENVIRONMENT WHERE EFFICIENCY PAYS OFF

Another key result is that most perspectives do not have a negative attitude towards regulation, regulations that set boundaries on urban freight logistics could create the need to change. However, the reactions from perspective 2 and 3, state that regulations should be to set boundaries and not to fulfil tasks that the market can provide as well (like standardization of loading units). It was addressed in perspective 1,2 and 4 that these kind of regulations could sometimes be unclear since they differ per municipality, the role of the government is also perceived as a dominant uncertainty (van Duin et al., 2016). Over a decade ago it was concluded by Van Duin and Quak (2007) that regulations were not analysed properly beforehand and there was no communication between municipalities. This changed over the years witnessing the development of the Green Deal: ZECL. The regulations should be nationally coordinated, according to perspective 1 and 2, and applicable to every actor so there is a level playing field.

The Ministry of I&W and municipalities that want to regulate urban freight logistics (e.g. Green Deal: ZECL) could create a nationwide policy-framework with pre-defined regulations intended to set boundaries. This should also be in consultation with the logistics sector. The boundaries do not have to be the same for every urban area in terms of demands since every city is different. This means that the demands can differ but the subject of the regulations should be the same. These subjects could be the size of the ZE zone, maximum number of vehicle exemptions per day or the height of a possible city entrance fee. LSPs should be able to find these in one place and be able to work freely within these boundaries. On the other side, the municipality should make sure that the rules are adhered to. Regulations should be analyzed beforehand in collaboration with the sector and other municipalities.

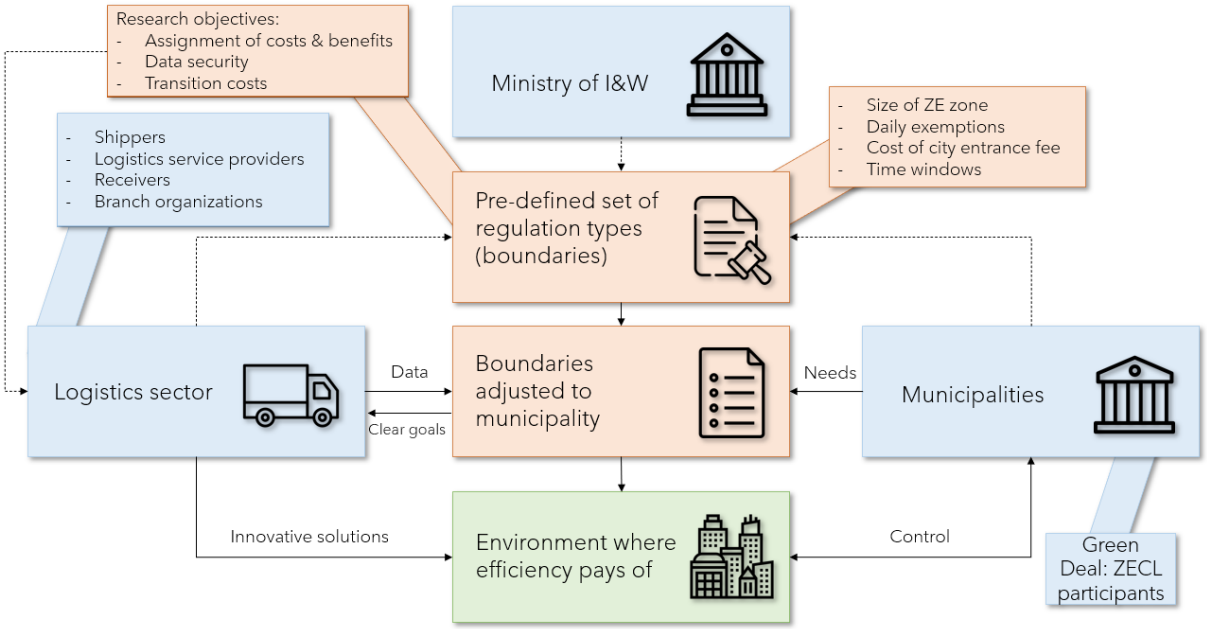

Figure 5.1: National regulation adjusted per municipality (van Son, 2020)

A problem for municipalities is that there is little insight in urban freight logistics, as stated by perspective 3 and 4. That is why some reactions state that data from LSPs would be very helpful. In this way the municipality knows what is going on and can more adequately regulate it. Due to this the regulation will have a bigger chance to result in a positive impact (Ballantyne et al., 2013). This is also presented in the second step from the roadmap to ZECL from SPES (2018). Logistics service providers can be better informed and helped with becoming more efficient due to this, which could save them costs and increase their marketshare. It should be a two way street since there has to be an incentive for the stakeholders to exchange information.

Due to these kind of regulations the last mile is getting increasingly expensive, especially shippers operating inefficiently will feel this. This could results in logistics demand moving to bigger LSPs that

have the volume to stay cost effective or innovative LSPs that know how to operate in a very efficient manner.

Accordingly, the key to moving forward to more sustainable urban logistics lies in a solution that provides both societal and economic advantages. As can also be seen in the results from the Q-analysis, companies are only going to share their data if there is a clear financial incentive. By setting the boundaries a landscape is created where efficiency pays off. The PI concept is not the starting point but can be a result of creating such a landscape. It can be concluded that a barrier to the PI vision nowadays is the absence of real need.

If the sector has an incentive to carry out their urban operations more efficiently they might also change their operations outside the urban areas. Urban freight logistics can become a space where innovation is accelerated and these innovations can be translated to operations outside the urban areas as well.

But according to Quak and Tavasszy (2011) a solution should not only be based on policy since this proves to result in unsatisfying outcomes. That is why it is also important to add a technical or a logistical part to the solution. This part should consist of looking at possibilities for PI characterises. It should not be the aim to design an open network, a platform for data sharing or develop standardized loading units but it should help the sector with problems they are dealing with to get there. Institutions like TNO and TKI Dinalog can be suited for researching these kind of things. The research objectives can originate from a collaboration between governmental organization and the logistics sector, just as how the pre-defined regulations should be established (figure 6.2).

Besides that, research objectives can be also based on barriers that resulted from the Q-survey (table 6.1). As already discussed, the 'need' to change should be there first, but that is what the regulations should achieve. Barriers related from table 6.1 can still remain in place. These barriers can become the research objectives on how to come to a 'PI-like-system', this can be related to:

- Assignment of costs and benefits
- Data security
- Transition costs
- Client relations in a new system

Pilots can help to understand the details related to these barriers. If a solution is found this can be tested in such a pilot to see if a solution is technically suitable. As mentioned by one of the participants, pilots should be in place to check technical feasibility and not to check economic feasibility since it is really difficult to realistically translate it to the market.

The creation of dynamic adaptive policy pathways (Haasnoot et al., 2013) can be helpful to define further actions. In the first step the system is described together with the objectives and the constraints. A future situation is defined, in this case this would be the implementation of PI characteristics in urban freight logistics. In the second step, the gaps between the current situation and the future situation are defined. This will aim on the differences between the two situations and the uncertainties belonging to those gaps. Also the barriers and opportunities to a new situation are assessed, this has also been done in this research. In the third step those opportunities and barriers should be used to define certain types of actions. In this step actions are thought out to, on the one hand, break down barriers, and on the other hand, use the opportunities that are present. These actions are all evaluated in the fourth step which makes it possible to create certain pathways consisting of different actions in step five. (Haasnoot et al., 2013)

In the following three steps preferred pathways are chosen, assessed and used to create a 'dynamic adaptive plan'. After that it is time for the implementation of the actions belonging to the chosen pathways. After monitoring the results of the actions the steps can be used again to iteratively improve the policy pathways. Step one and two are related to this research since the current situation and a desired future situation are thought out. Besides, the opportunities and barriers belonging to the change to the new situation are defined. A framework was created to define individual and collaborative actions for the different stakeholders. (Haasnoot et al., 2013) However it lacks sequential actions and detailed policy plans. Based on this information it can be concluded that creating policy pathways could be a suitable continuation of this research.

5.3 ACTIONS THAT ACTORS SHOULD UNDERTAKE

The framework stresses the need of cooperation between different actors but also shows the actions specific actor groups should undertake. Since urban freight logistics is a socio-technical system the actions are both policy and technology related.

As discussed with the framework municipalities should regulate urban freight logistics in such a way that it is nationally coordinated and by that unambiguous. This can be achieved by a cooperation between SPES municipalities and the ministry of I&W. Besides that, information from the sector is needed to increase the success rate of regulations (Ballantyne et al., 2013). On the technical side municipalities can realize public-private partnerships with the logistics sector to, for example, start pilots. As stated earlier, those pilots can be related to the barriers that are found and should have the aim of proving technical feasibility, not economic feasibility. This is also a strategy that is applied on Mobility as a Service (KNV, 2019) which is a topic that has overlap with the PI characteristics based on asset sharing - Logistics as a Service.

The ministry of I&W should facilitate the cooperation between municipalities to get to national coordinated regulations. This can be done by making use of the SPES cooperation that is already in place, it is important to also focus on other topics than just ZECL. Efficiency is found very important by certain actors in getting to more sustainable urban freight logistics so this should be high on the agenda as well. The PI characteristics can help with becoming more efficient so it is important to regulate in such way that making use of these becomes more interesting. This can be coupled to data sharing and asset sharing in the current data driven logistics program (Transport & Logistiek, 2020).

The logistics service providers see opportunities for sharing assets and data to achieve higher efficiency and lower costs. However, this still happens too little because they run into different barriers. These are, for example, the transition costs, continuing to offer the same service quality and an adequate cost and benefit distribution. In addition, it was also reflected that the need is not always there to change, but by setting boundaries more efficient operations can become more important. If LSPs have the will to change, they should be given the opportunity to investigate how these kinds of barriers can be overcome.

Table 5.2: Individual and collaborative actions that stakeholders should undertake

From/to	**LSPs (and branch organizations)**	**Municipalities**	**Ministry of I&W**
LSPs (and branch organizations)	(1) Find knowledge gaps behind the barriers to sharing of assets and data	(1) Flow data and load factor (2) Operational knowledge gaps	(1) Express knowledge gaps linked to barriers that are experienced
Municipalities	(1) Boundaries for urban freight logistics (2) Provide possibilities for pilots with the aim testing technical feasibility	(1) Determine boundaries for urban freight logistic (2) Think about adequate regulations	(1) Communicate boundaries and regulatory alternatives
Ministry of I&W	(1) Provide research possibilities (e.g. TNO)	(1) Platform for cooperation between municipalities (e.g. SPES)	(1) Provides basis for national coordinated regulations on urban freight logistics

The PI community will have to deal with these kinds of barriers and come up with solutions for them. How exactly is it going to work from an operational point of view? Make a vivid representation of this and present it to the logistics sector. It will then have to be determined whether the logistics sector can find itself in such solutions or not. The PI community will have to contribute to pilots in the urban freight logistics landscape by entering into partnerships with governments and the logistics sector.

5.4 REVIEWING THE PRESENTED APPROACH WITH THE REVEALED PERSPECTIVES

The approach that is presented in this chapter is based on the insights that the different perspectives gave. Besides that the barriers and opportunities were distilled from the textual explanations received from the participants. For a final check it is evaluated how every perspective relates to the presented approach.

Perspective 1 - Trust in an open platform and standardization of loading units to make urban freight logistics more sustainable, realistic regulation needed to set boundaries

This perspective does not believe in too many obligations from governmental organizations. An example of this is that data sharing might be useful but LSPs should not be obliged to do it. However, they see a role for the municipalities to increase regulations in order to accelerate a transition to more sustainable urban freight logistics. Consequently, the approach presented in this chapter applies to the vision of perspective 1. There positive attitude towards container standardization is something that can be a research objective in the presented approach. However, that the government should introduce a standardization of smaller loading units is also positively ranked in this perspective and that will not be the case in the presented approach.

Perspective 2 - It is already possible to work very efficient, moderately negative towards PI characteristics and governmental influence should be limited

Perspective 2 states that a lot is possible already and that the government should only set certain boundaries but that the rest should be left for the LSPs. This is one of the reasons that the chosen approach does not encourage strong intervention in the market. Pilots can be done, but just to check for technical feasibility. Strict deadlines are needed to enforce a transition, but that transition should be possible for the logistics sector as well. In an environment where efficiency pays off these LSPs characteristics of this perspective are fully appreciated.

Perspective 3 - Zero emission is important but operations should primarily become more efficient, asset sharing and data standardization are promising to achieve this

Efficiency is key according to perspective 3 and will have a more positive impact on urban liveability than changing to ZE vehicles. The government should have an active role in setting the limits and encouraging good initiatives. Besides that the importance of data standardization is named as something important to share assets. Barriers that come with this can be researched according to the approach presented. In the end, this perspective states that innovation has to come from the sector. This fits with the idea of the environment where efficiency pays off. This perspective will definitely advocate this way towards a more sustainable future.

Perspective 4 - An open platform will bring more efficiency to urban freight logistics and city hubs will still be needed together with regulation and stimulation

Perspective 4 would like to see more strict regulation from municipalities. Obligating the sharing of data would be a good thing and there should be more regulations for urban freight logistics in general. An open platform will be the future of logistics and they do not think that smaller players are going to be excluded due to this. The level of stimulation that this perspective pursues is not on the same level as the approach in this chapter presents. Just as seen in factor 1 some perspectives can not be adhered to fully, this would exclude other perspectives (2) from agreeing with the presented approach. However, this approach will be mostly in line with the wishes of the participants that represent this perspective.

It can be concluded that the presented approach meets with most of the perspectives. It does not completely adhere the wishes of every perspective but this is not possible with the different viewpoints that exist. One of the important things is that no perspective should totally disagree with the way towards an environment where efficiency pays off. With the approach that is presented in this chapter that should not be the case.

6 CONCLUSION, DISCUSSION AND RECOMMENDATIONS

6.1 CONCLUSION

The main aim of this research is to investigate what barriers and opportunities exist for the implementation of PI characteristics in urban freight logistics. This question has been answered by mapping the different perspectives that live among stakeholders. In addition, it has been investigated how this knowledge can contribute to a more sustainable way of urban freight logistics. Ultimately, a policy framework was created, which should ensure that an "environment where efficiency pays off" can be established.

Dutch urban freight logistics is dealing with environmental, social and economic unsustainabilities (Quak, 2008). Due to new influences, persistent economic growth and urbanization (table 2.1) it is expected that pressure on the urban freight logistics system will increase. In urban freight logistics 5 different stakeholders groups are represented: carriers (1), receivers (2), shippers (3), local authorities (4) and residents (5) (Quak and Tavasszy, 2011). A significant share of urban freight logistics operations is currently being handled by shippers or receivers themselves, which causes inefficiencies (Ploos van Amstel, 2017). Theoretically, it could be more (cost) efficient to share assets and consolidate deliveries for the urban area (Janjevic and Ndiaye, 2017).

Along these lines, the PI concept could be useful as it is based on sharing assets in an open system consisting of a network of hubs (Montreuil, 2011). Characteristics of the concept, like standardizing collaboration protocols and smaller loading units, can accelerate data and asset sharing. In this concept, assets like DCs and vehicles could be shared in order to optimize the load factor for the last urban mile (Crainic and Montreuil, 2016). The latter can be realized through collaboration of multiple LSPs in an open supply network (table 2.7). Logistics decision making could then shift from the LSPs to the shippers, yet the LSPs are still needed for the operational part (Ciprés and de la Cruz, 2019).

The PI concept being promising has been demonstrated several times on the basis of conceptual and quantitative studies (Ballot et al., 2012) (Yang et al., 2017) (Pan et al., 2014). However, relatively little qualitative research - based on surveys or interviews - has been conducted (Treiblmaier et al., 2016). This research therefore focuses on examining how stakeholders look at the PI concept. The stakeholders involved in this study consist of municipalities, LSPs, and branch organizations based on their relevant roles in the current system: municipalities determining the rules in the urban areas, LSPs providing the operational part and branch organizations representing the latter.

On the basis of literature research, both grey and scientific literature, and interviews, the discourse around this topic has been established in statements (section 3.3). These statements were then assessed by a group consisting of municipalities, LSPs and branch organizations in a Q-survey. By doing so, the different perspectives in the field of city logistics and the implementation of PI have been determined.

In the end, four different perspectives were extracted, each of which giving its own view on the subject. The four perspectives are:

1. Trust in an open platform and standardization of loading units to make urban freight logistics more sustainable, realistic regulation needed to set boundaries
2. It is already possible to work very efficient, moderately negative towards PI characteristics and governmental influence should be limited
3. Zero emission is important but operations should primarily become more efficient, asset sharing and data standardization are promising to achieve this
4. An open platform will bring more efficiency to urban freight logistics and city hubs will still be needed together with regulation and stimulation

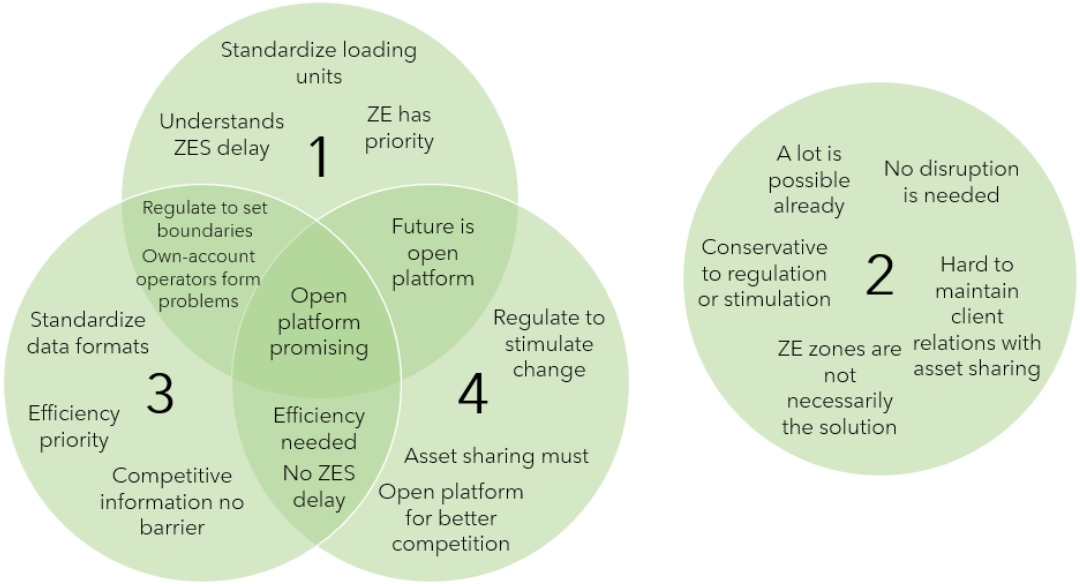

Figure 6.1: Similarities and differences between all the perspectives

What is remarkable about these perspectives is that the PI characteristics are generally perceived as positive. However, one perspective ascribes more importance to the standardization of loading units, while the other attaches more value to the standardization of data formats. It is generally thought that an open system where logistics supply and demand meet is promising for the future of the sector.

In addition, it is interesting to see that regulation is not viewed negatively in any of the perspectives. Yet, there certainly are differences in the degree of regulation, for example, one perspective states that municipalities only need to set boundaries and another argues that a government organization should introduce a standard for loading units. There is consensus that more regulation is welcome in urban freight logistics, but that it must be coordinated nationally.

However, the fact that PI characteristics are generally assessed positively does not answer why they are not yet being used. To get an answer to this, the textual explanation of the Q-surveys was analyzed for the presence of barriers and opportunities, which are shown in the following table:

Table 6.1: Named barriers to PI and corresponding opportunities

Barrier to PI	**Count**	**Opportunity**	**Count**
Open platform causes a monopoly	P1	Smaller parties can be better involved due to an open system. Open platform will cause healthy competition and more efficient operations.	P1, P2, P3, P4
LSPs are digitally not advanced enough	P4	Most LSPs do collect data but do not know what to do with it. An app could help with this issue.	P1
Fear of sharing competition sensitive information	P2, P4	This is not such a big deal in practice, collaboration is already needed to create advantages. Due to low level of professionalization caused by a market that is easy to join this fear exists.	P1, P2
Sharing costs and benefits accordingly	P1, P2	An open platform where logistics service demand and supply meet.	
Current networks suffice	P2, P4	Different data formats, also on loading units.	P2, P3
Transition costs to new system	P2, P3	Creating a need will make change worth it, this need will eventually come. A disruption can also accelerate this transition.	P3, P4, P4
Inability to maintain strong relations with asset sharing	P2	This is possible only the relations will be different based on different criteria.	P3, P3
Specific services cannot be provided with asset sharing		In practice there are little specific services, fast delivery or pick-up is most important.	P3

It is striking that some elements are seen as an opportunity by certain participants, while others label refer to them as barriers. However, for distributing costs and benefits accordingly no opportunity has been mentioned - this appears to be an important barrier. In addition, it is expected that the transition costs to a new system will no longer be a barrier in the future because the need to change will increase. The latter does indicate that this currently is a barrier. This also coincides well with the generally positive assessment of the statement about increasing regulations regarding urban freight logistics, which has the potential to create a certain need to change.

With this information, the main question regarding the barriers and opportunities has been answered. However, there is also a second question that deals with the use of this information. A kind of policy framework has been created with the information from the various perspectives. This framework shows how an ”environment where efficiency pays off” can be created.

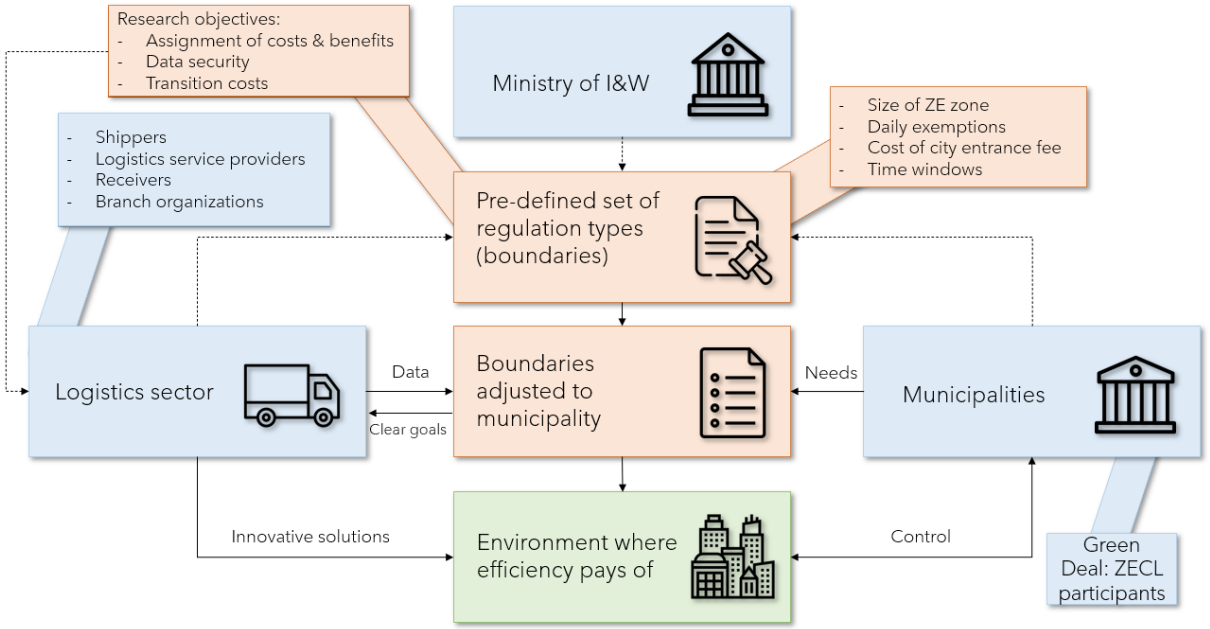

Figure 6.2: National regulation adjusted per municipality

On one hand, this can be achieved by drawing up unambiguous, national regulations that set clear boundaries for urban freight logistics per municipality. This contains regulation on certain subjects that can be adjusted per municipality according to their requirements. The subjects of these measures are determined in consultation with the logistics sector and the Ministry of Infrastructure and Water Management. This way, clear communication per municipality to the logistics sector can be established concerning the restrictions in that specific area. In addition, municipalities also indicated that it is important for the logistics sector to share information with them, as with better insight into their operations more realistic goals can be set.

Not all perspectives agreed on the influence of municipalities in other policy areas. That is why it was decided not to actively set up initiatives from the government in this framework, along the lines of perspective 2 which emphasized that the market itself can also do a lot. However, it is interesting to help the sector by investigating the barriers they encounter. Research may contribute to create mutual understanding and removing these barriers, thereby enabling the sector to innovate itself.

Following this framework, an ”environment where efficiency pays off” can be created. Regulations are forcing the sector to become more efficient whilst barriers are being removed through research. This ties in well with all perspectives that look positively at PI characteristics as well as at national regulation of urban freight logistics.

6.2 DISCUSSION

In the first part of this discussion the usability of the method will be reviewed. The second part discusses the results and the implementation of those results.

6.2.1 Academic reflection

As this research was based on Q-methodology, this inherently comes with some implications. Results can only be validated by feeding back the resulting perspectives to the participants and letting them assess those (Ramlo, 2016). This means that these perspectives are indeed present within the group, but can not be generalized to a bigger population. Due to that condition, it can not be ruled out that other perspectives are present on the subject.

Besides, a part of the participants was approached with the help of contacts obtained in seminars of CILOLAB (TNO, 2019). The actors present in those group are already actively working on improving their urban activities, which is the main goal of this collaboration. Thus, participants originating from here may already be more concerned with unsustainabilities in urban freight logistics, which could result in a bias.

Moreover, the survey was sent out to around 60 different municipalities and LSPs, and to two branch organizations. Not all of those actors responded on the request to fill out the Q-survey. This could mean that the participants that indeed reacted were more concerned with the subject already.

Q-methodology proved to be helpful in revealing different perspectives on the subject. However, the scope and the subject of the research were quite comprehensive. An implication of this was the need to provide a lot of explanation and information in a relatively small amount of time. In order to quickly explain the research and the subject, an explanatory video was added to the survey. This also made sure that the participants all had a minimum amount of knowledge on the subject before filling it out.

However, it was not possible to elaborate on every statement in the research. A social Q-survey is set up with a main question and statements all being an answer to this question (Webler et al., 2009). This makes it easier for the participants to understand the statements and the methodology. Setting up the statements like in this research proved to be quite challenging, as including every view on such a comprehensive subject is next to impossible.

Also the interpretation of the perspectives was quite challenging, since multiple statements were in some cases merged into one statement. An example of such a statement is the following *'Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.'*. If a certain participant agrees with this statement it can be interpreted easily since he or she agrees with both of the merged statements. The problem, however, arises when a participant does not agree with this statement, as this can mean two things: either the participant does not agree with one of the statements or the participant does not agree with both of the statements. This also resulted in participants experiencing difficulties with filling out the survey. In hindsight, it is recommendable to do this differently. Yet, the validation showed that perspectives seemed to be quite accurate still.

Finally, some participants could not fill out the survey because they did not understand its goal. These were participants from a branch organization and a municipality. They had trouble assessing the somewhat controversial statements since they were speaking on behalves of their organisation. After it was explained that the goal was to extract different group perspectives, they experienced less difficulties with filling out the Q-survey. They needed the reassurance that their resulting group perspective would be validated with them.

6.2.2 Results and implementation discussed

From the different perspectives the overall conclusion was drawn that there is a quite positive attitude towards PI characteristics in relation to urban freight logistics. It was also concluded that there are still some barriers in the way towards this transition. However, a positive attitude is something different than really implementing it. It can easily be said by participants that this might be the future but it might be hard to oversee the consequences of such a transition.

This also holds for the positive attitude towards regulation. Since regulations were named in a general sense every participant can have a different perception of what those regulations should be. This could possibly mean that both participants are positive towards regulation but only towards the regulation they think is important for themselves. On the other hand, regulations on urban freight logistics are already present in multiple urban areas so different understandings of this might be present only in a small amount.

It can also happen that one perspective shows two different views on a certain statement. Although, if they do correlate, it means that there is significant overlap as well. This was seen in perspective two were one of the participants had a very different perspective on regulation in comparison to the others. This difference was also validated by the participants themselves and took into account with the implementation part of this research.

That not all the different stakeholder groups acting in urban freight logistics are included in this research means that there is no overarching view on the subject established. However, these stakeholders were chosen regarding their role in a system with PI characteristics, especially for LSPs a lot can change so this made it interesting to get their perspective on these developments. Besides that, this made it possible to design the statements especially to the stakeholder groups in the research which meant that most of them could relate to the statements. But still it is a limitation that not all the stakeholder groups are included.

Since the different perspectives did not show a lot of distinguishing statements related to barriers on implementation of PI the textual results were analysed. This does indeed show what barriers there are present but this is not directly linked to the correlations between participants that are found in the Q-analysis. It was chosen to add this part of qualitative analysis because some extra value could be found here. The textual results provide a lot of information on the perspectives, however, the existence of these barriers in groups could not be statistically proved.

The policy framework that was proposed was based on the different perspectives that were found. Every perspective should be able to relate with this, otherwise the framework would leave out a certain group of stakeholders. The actions that are proposed in the framework might not be entirely new. An example of this that there already is research conducted by organizations on implementation of new logistics systems. Besides that, the need for unambiguous nationally coordinated regulations is also something municipalities already try to work on with the Green Deal: ZECL. But the results of this research underlined the importance of those activities.

6.3 RECOMMENDATIONS

The recommendations in this chapter are based on the topics that have been presented in the discussion. On the basis of this information recommendations for further research are presented. The recommendations related to implementation of the results can be found in chapter 5. Besides, recommendations for implementation are also discussed in the conclusion.

In some statements, two statements were merged into one statement. This could have had an influence on the resulting perspectives. It would be interesting to see if that is indeed the case. Further, due to the way participants were approached for the Q-survey, it might be the case that the majority of them was already concerned with sustainability of urban freight logistics. A different way of approaching participants might result in different kind of perspectives. It would also be interesting to check if this might have had an influence on the perspectives.

For the use of Q-methodology it can be wise to use a less comprehensive scope since this can make the statements in the Q-survey more clear to the participants. Besides that it is easier to include a bigger part of the discourse in the statements. Some Q-sort are designed in such a way that all the statements answer one, specific, question. This makes interpretation of the perspectives easier but narrows the possible scope.

Since this research only shows that there is a positive attitude towards PI characteristics, it might be interesting to make those characteristics more vivid an research preferences based on that. This could result is some kind of concept sketch where participants have to assess a certain design of a PI like system. By presenting different designs it can be investigated what operational characteristics are important for stakeholders.

The previous recommendation can also be used to investigate the barriers towards PI in more detail. The barriers that results from this research were not significantly attached to group perspectives. Besides that, barriers become easier to understand if a certain design of a PI like system is present.

In the approach that was presented in chapter 5 different regulative measures were named for stimulating efficiency. It is important that these measurements are analysed before they are implement. For this purpose dynamic adaptive policy pathways (Haasnoot et al., 2013) could be used that is presented in section 5.2. With this analysis it is possible to determine the effect of different policies for each stakeholder and how these actions link up with each other.

In this research not all different stakeholders were investigated regarding their perspective to the implementation of PI characteristics in urban freight logistics. From the 5 different stakeholder groups, the shippers, receivers and residents were not included. It could be interesting to include those in further research. Those stakeholders will probably have different perspectives regarding the subject. The statements should be adjusted in such a way that all the participants can relate to them.

Especially the own-account operators are an interesting group since it is believed that these cause a substantial amount of the inefficient operations in urban areas. They were not taken into account for this research but it is interesting to find out how this group can be persuaded to more efficient operations, this can be related to costs, service level or flexibility. Since this is a very big group of different actors (shippers and receivers) it is a challenge to get in touch with a representative part of them. This is also something that some municipalities are struggling with (appendix A). Also for this reason they were left out of this research but, as mentioned, it is really interesting to gain knowledge on their motives.

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A | INTERVIEWS

A.1 1, MINISTERIE VAN I&W

In urban freight logistics a lot of shippers and receivers choose to take care of their own logistics because of:

- Flexibility
- Service level
- Creativity

Shippers often offer specific, tailor made, logistics services that do not come at an extra cost. Those costs are actually hidden costs.

The ability to work with a standardized system is very branch specific.

An open system where logistics supply and logistics demand would be very useful, however, the step towards such an innovation should be small.

The decision making power to share data or not is always with the company, it can not be mandatory to share data.

It would be most convenient if a system to share data emerges from the market.

The goal of the green deal zero emission city logistics (ZES) is cleaner transport but also less vehicle kilometers in urban areas. By making it obligatory to use a zero emission vehicle transport prices may rise. The rise of those prices can also be an incentive to a more efficient use of the vehicles.

By making zero emission transport mandatory you force companies to invest in suitable vehicles so for these investments there will be a subsidy.

The price of procurement is the biggest problem but the costs per kilometer are lower so leasing those vehicles would be a smart option.

There is a fear that after electrifying transport everything will go back to business as usual but than electrified, so no efficiency gains. There might even be more vehicle kilometers since zero emission vehicles are mostly smaller than the regular vehicles.

But in most city centres heavy vehicles get banned anyway because they can damage the vulnerable historic infrastructure.

Another thing that can be an incentive for organizing urban logistics more efficiently is the increasingly smaller space available due to infringement of urban areas.

Sharing data is going to have a positive influence on urban freight logistics.

The national government want to deliver standards in sharing of data, with this it becomes easier to share data. Making a platform to do this could help.

There could be licenses for providers to get products in to the city, with that license can come duties to share data.

Sharing of assets can be problematic since there can be cherry picking. You keep the jobs for your own company if they pay the most and the other jobs can be shared. Very complicated to share costs and profits accordingly.

Road pricing can cause a better logistics efficiency but does not fit in the current political landscape.

Road pricing for freight vehicles from the highways could be extended to urban areas.

The cities decide what is going to happen in their city regarding to legislation but the national government tries to make the cities work together in a coordinated way.

There is no zero emission zone yet so it is not sure what logistics is going to look like in that situation.

Breytner has a solution but it proves to generate extra costs which makes it harer to implement on a large scale.

Standardized containers can certainly help with making urban freight logistics more efficient.

A.2 2, TU DELFT

Collaborations between a limited amount of companies can be seen as a first step to a Physical Internet.

In bigger logistics companies there is already a Physical Intranet since they use their own assets on the places that they need them. Besides that they sometimes buy logistics services in areas where they can not provide them.

Optimization in Physical Internet is hard because the objective is not the same for everyone. Besides that, on every system level the optimum can be different. An optimization on the highest level of PI will search for a global optimum but will not take into account the wishes of every actor in the system. Because of that a sort of online auction for logistics services seems the first step.

There are new companies that try to disrupt the logistics market based on digital technology. An example of this is Flexport. It is interesting that together with the growth of the company they also move to the more traditional LSP's. But, their fundamentals are different, and that fundamentals are really hard to change in larger companies.

What is wrong with a race to the bottom, this is the main idea of capitalism.

All around the world they are busy with implementation of those concepts but, especially for urban freight logistics, it is really dependent on the characteristics of the cities.

A.3 3, GEMEENTE ROTTERDAM

It is hard to reach service levels of clients in the city centre for logistics service providers since they often require special services.

Since the local green deal in Rotterdam there is some kind of consolidation going on. A certain company owns a zero emission vehicle and they serve the part of the town where the local green deal is active.

The side of the receiver is very dynamic which makes it hard to make arrangements for a longer period of time. The best way to reach out to these actors is by releasing news about a zero emission zone where they might react to.

Municipality does not want to intervene if it is unnecessary and prefers to let the market take care of it.

A disruption can also be cause by a governmental organization by setting new rules in the playing field or innovate with a certain technical solution.

It is believed that logistics service providers operate with a certain efficiency and that the real inefficiencies originate from own-account operators that take care of their own logistics. This results in vans entering the city to only deliver a small amount of goods at a small number of locations.

A certain kind of asset sharing can already be seen in the waste industry where waste is consolidated and delivered at the destination. The waste collectors earn that money at delivering the waste. The transport itself does not profit the company so that has to be done as efficiently as possible.

In other sector is can sometimes be that there are deals that are profitable for the logistics service provider when done in a certain, more inefficient way, which does not give an incentive to make the operations more efficient.

There is little known about urban logistics flows since it is hard to measure them. It is possible to count the vans and lorries that enter and exit the urban area at certain point but it is unknown how those are loaded.

There are a lot of initiatives from companies to make urban freight logistics more sustainable. Some logistics service providers want the zero emission zone to become as large as possible because this makes it possible for them to take care of all the logistics service demand in that region.

A.4 4, TOPSECTOR LOGISTIEK

Costs in logistics are hidden, for example, when you order a package delivery is 'free' in almost all of the cases. In reality, of course, there are certain costs to that transport move but the client does not get to see those.

Sometimes, the issue of a lack of loading and unloading areas is brought up, but in reality there are sufficient areas available. There are people that wrongfully park their car in those areas which occupies the loading and unloading zone. So that is the real problem and not the lack of the amount of loading and unloading areas.

There is enough space around the urban areas to accomodate urban consolidation.

An urban consolidation centre is a part of the solution but certainly not the answer to all the urban logistics problems. Besides that, it proved to be hard to make an urban consolidation center economically feasible without governmental support.

Sharing data and working together is the key to success but it is hard to make that happen.

Financial incentives are the most important to get to a certain change. When something is not financially feasible in the market it won't be a durable concept.

When bundling before entering an urban area is mandatory the playing field changes, this could be a solution.

Companies also take care of their own transport because they want to operate under their own flag.

The goals of the green deal zero emission urban logistics are realizing zero emission transport but also reducing the amount of transport kilometers in urban areas. But the green deal originated from the climate agreement which aims at reducing greenhouse gasses in the Netherlands.

Not everyone can pay the price of zero emission vehicle so this might be an incentive to bundle their deliveries.

Maybe companies are going to think a bit more about their logistics because of the green deal, how can we do it a bit more efficient?

In the smaller companies there is most of the time no sustainability manager so this is also not one of their priorities.

The margins in logistics are really low which results in a lower priority for sustainable operations.

The green deal ZES should be nationwide, this is also a wish from the logistics sector.

A system for sharing data should originate from the market but there have to be certain rules attached to it.

Those rules should make sure that data can be shared in a secured way. It should make sure that companies can make use of the same assets without knowing everything from one another.

Standardization of packages is something that people are busy with but this can also result in inefficiently filled packaging. This is a problem of packaging standardization.

A.5 5, STOCKSPOTS

A market place for logistics services is more flexible and scalable.

Warehousing services are priced in four components, inbound, storage per week, outbound and an hourly rate for extra services.

There are hidden costs in logistics, who pays for the last mile?

Nothing is going to change if cities do not intervene.

There is a company working on software for efficiently filler containers.

The smaller the units the higher the costs per volume.

Existing volumes are already with logistics service providers that do a good job. They work efficient with a good interdrop. This makes it hard for new companies to enter the market.

There is a lot of overcapacity in city transportation when it is linked to people transportation. Connecting the people movements to freight movements is interesting but a certain user base is needed to make it successful.

Urban logistics is something that is on the agenda for a long time already but little has changed over the passed 35 to 40 years.

Sometimes pilots are performed to test a new concept but most of the time this is with low volumes and because of that it does not work. These pilots mostly originate from goodwill.

Urban logistics is mainly a topic for consultants.

There is a will to cooperate with urban consolidation centres but this has to be arranged nationally.

The last mile adds extra costs and those have to be paid by the receiving party.

The problem needs to be big enough to come to real improvements and apparently the problem is not so big right now. Besides that, the solutions are not financially attractive which makes it a hard business case.

Every alderman likes to do something with improving urban goods logistics but mostly because it looks good.

Urban consolidation centres can only survive with subsidies.

Transport between two locations is difficult to get started.

Bringing it in practice is very difficult.

Standardization of packaging can be done as shown by big internet retailers that sell products from other retailers as well.

If the capacity is available the incentive to work more efficiently is not there.

Companies that prove to be successful in urban logistics should take care. Efficiency comes with scale.

If ZES is implemented bigger companies are going to take over urban logistics because they are able to deliver in a sustainable way.

In logistics pricing is more important that zero emission.

Road pricing can be interesting in urban areas since this will stimulate innovations but that kind of interventions mostly do not happen in the Netherlands.

Big tech companies are going to provide a solution and further standardize logistics to make use of robotising and automation.

A pallet with a standardized kind of information could already be very useful.

Standardized information on modules is more important than a standardized size.

Logistics is going to be data driven and algorithms and robotising are going to play a big role in that.

There are some companies that do not want to share competitive information but in reality most of them are not as concerned with that. The online system should be secured but making use of the same warehouse is not the problem.

A.6 6, FLITSMEISTER PICKUP

It is interesting to use the community to carry out other services as well.

We saw that logistics can be inefficient and that there is a need for reliable on demand delivery from shops.

The app can be used for people to create revenue by delivering packages.

On the one hand this can be people that specifically drive to a certain location to deliver a package, on the other hand in can be someone that already is going to make that trip but can make a delivery as well.

The second form is especially interesting since no extra trip is made for transporting the package which makes it a green alternative.

There is no ambition to become a logistics service providers of any kind.

We are just providing a service and platform that we believe in and do that in our way.

I do not know if zero emission legislation is going to hurt the platform or make it more interesting.

An open system does not necessarily have the risk of forming monopolies.

A platform like this for logistics could even create better competition since there is more openness.

In the logistics market there is a limited amount of data sharing, when looking at parcel deliveries, there is still no real time track and tracing available.

Next to that, multiple different LSP's can show up at your door in one day to all deliver a different product.

Maybe the logistics market is not challenging enough to accelerate innovation.

On the other hand there is a race to the bottom going on which mostly indicates that there is a lot of competition on the market.

An disruptive digital innovation can cause a change in the logistics market, when we announced our platform LSP's already called us out of interest.

A package for our platform does not need to be standardized.

Our platform does not aim on executing other activities than delivering the package, if the client needs anything else it should consider another service.

City logistics forms a problem and will change the coming years following the line of urban person mobility, an increased importance of livability in cities.

B | Q-SET

Table B.1: First part of the Q-set

	Statement	Characteristic	Dimension
1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Asset sharing	Logistics
2	Efficiently sharing assets will remove the need for dedicated urban consolidation centres.	Asset sharing	Logistics
3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Asset sharing	Societal
4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	Asset sharing	Market
5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	Asset sharing	Societal
6	Most parties have the will to share assets but the transition costs are currently not outweighing the benefits.	Asset sharing	Market
7	The logistics sector is based on strong long lasting client relationships which are hard to replace with a system based on asset sharing	Asset sharing	Logistics
8	Most logistics companies are not digitally ready for sharing of data and that should change as soon as possible.	Data sharing	Data
9	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.	Data sharing	Data
10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	Data sharing	Data
11	A digital disruption in the logistics sector is needed to make companies share their data.	Data sharing	Data
12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	General	Market
15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	General	Societal
16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	General	Logistics
17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	General	Market

Table B.2: Second part of the Q-set

	Statement	Characteristic	Dimension
18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	General	Market
19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	General	Societal
20	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	General	Logistics
21	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	General	Societal
22	A governmental organization should be in charge of a standardized data sharing platform.	Stand. Coll.	Market
23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	Stand. Coll.	Market
24	An open platform where logistics service demand and supply meet will be the future of logistics.	Stand. Coll.	Logistics
25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal
26	An open platform for asset sharing causes better competition instead of forming a monopoly.	Stand. Coll.	Market
27	Difference in data formats on loading units is currently a major barrier to asset sharing.	Stand. Cont.	Data
28	Size standardization of smaller loading units will accelerate the sharing of assets.	Stand. Cont.	Logistics
29	The current level of loading unit standardization in logistics is adequate for sharing assets.	Stand. Cont.	Logistics
30	Standardization of smaller loading units should be introduced by a governmental organization.	Stand. Cont.	Market
31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Stand. Cont.	Logistics
32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban logistics affordable.	General	Societal
33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
34	Municipalities should force to make companies share their data, just like they force them to use zero emission vehicles.	Data sharing	Data

C FACTOR ANALYSIS

C.1 PRINCIPAL COMPONENT ANALYSIS

C.2 FACTOR LOADINGS

Table C.1: Factor loadings flagged (X) at p<0,01 (KADE v1.2.0)

Q-sort	**Factor 1**	**F1**	**Factor 2**	**F2**	**Factor 3**	**F3**	**Factor 4**	**F4**
Gemeente Amsterdam	0,7499	X	0,0079		0,196		0,0575	
DPD	0,6165	X	-0,0485		0,0516		0,0312	
PostNL	0,5868	X	-0,2951		0,1757		0,4734	
PARCLS com	0,5244	X	-0,0049		-0,1325		0,25	
Gemeente Zwolle	0,5136	X	-0,0143		-0,2414		-0,0033	
Peter Appel Transport	0,475	X	-0,0964		0,2136		0,0002	
Vervoerregio Amsterdam	0,4606		0,3105		0,2935		0,1798	
Cornelissen Transport BV	0,2927		0,0681		0,2434		0,2081	
Netwerk Benelux	0,0526		0,781	X	0,0037		-0,1228	
Bode-Scholten	-0,0791		0,7103	X	0,0629		0,0316	
Gemeente Den Haag	-0,0772		0,5384	X	-0,1595		0,1522	
Breytner	0,0097		0,505	X	0,1734		0,3428	
Gemeente Leiden	0,2822		-0,4811	X	0,2161		0,1437	
UPS	0,3558		0,4717		-0,1642		0,4227	
GS1	0,1344		-0,0469		0,7778	X	0,0478	
Gemeente Rotterdam	-0,1119		-0,0443		0,6966	X	0,2485	
Gemeente Zaanstad	0,1995		0,0254		0,6887	X	0,2239	
TLN	0,2327		0,4583		0,5659		-0,3652	
FedEx	-0,1414		-0,2396		0,5459	X	0,0213	
Gemeente Utrecht	0,3012		0,1582		0,503	X	-0,2587	
Ministerie I&W	-0,2033		-0,1863		0,2682		0,2033	
Gemeente Enschede	0,0237		0,0882		0,3306		0,6495	X
CityHub	0,126		0,0091		0,4117		0,5848	X
Provincie Brabant	0,0674		-0,1749		0,1444		0,5846	X
Evofenedex	-0,4776		0,2362		0,0625		0,5334	
DLG	-0,0825		0,2204		-0,341		0,5086	X
Euser	0,2663		-0,2174		0,1128		0,5049	X
DSV	0,1841		0,1711		-0,0943		0,438	
HAVI Logistics	0,3126		0,2024		-0,0241		0,3977	

C.3 FACTOR Q-SORTS

Composite Q sort for Factor 1

-4	-3	-2	-1	0	1	2	3	4
✳✳◀ Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	✳✳ Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	✳✳◀ Most logistics companies are not digitally ready for data sharing while they should be.	✳✳◀ Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Difference in data formats on loading units is currently a major barrier to asset sharing.	✳ Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Municipalities should regulate urban freight logistics more to tackle ustainabilities but it should be nationally coordinated.	✳✳▶ Size standardization of smaller loading units will accelerate the sharing of assets.	✳✳▶ Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.
An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	✳✳◀ Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	✳ Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	An open platform where logistics service demand and supply meet will be the future of logistics.	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.
	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	✳✳ Strong long lasting client relationships can not be sustained with a system based on asset sharing.	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	✳✳ Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	A governmental organization should be in charge of a standardized data sharing platform.	✳✳▶ Standardization of smaller loading units should be introduced by a governmental organization.	
		An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	An open platform for asset sharing causes better competition instead of forming a monopoly.	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	A disruption in the logistics sector is needed to make companies share their data.		
			✳ The current level of data format standardization is generally sufficient for the sharing of assets.	The current level of loading unit standardization in logistics is adequate for sharing assets.	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.			
				Even the introduction of road pricing in urban areas won't increase level of asset sharing.				

Figure C.1: Composite Q-sort for factor 1 (KADE v1.2.0)

Composite Q sort for Factor 2

-4	-3	-2	-1	0	1	2	3	4
✳✳◀ A governmental organization should be in charge of a standardized data sharing platform.	✳✳◀ Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	An open platform for asset sharing causes better competition instead of forming a monopoly.	✳✳▶ An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	✳▶ Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	Most logistics companies are not digitally ready for data sharing while they should be.	✳✳▶ The current level of data format standardization is generally sufficient for the sharing of assets.
✳✳◀ Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	Difference in data formats on loading units is currently a major barrier to asset sharing.	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	✳✳▶ Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	✳✳▶ Strong long lasting client relationships can not be sustained with a system based on asset sharing.
	✳✳◀ A disruption in the logistics sector is needed to make companies share their data.	✳ The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	✳✳▶ Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	
		Standardization of smaller loading units should be introduced by a governmental organization.	✳✳◀ Municipalities should regulate urban freight logistics more to tackle ustainabilities but it should be nationally coordinated.	✳▶ An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	An open platform where logistics service demand and supply meet will be the future of logistics.	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.		
			Even the introduction of road pricing in urban areas won't increase level of asset sharing.	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Size standardization of smaller loading units will accelerate the sharing of assets.			
				The current level of loading unit standardization in logistics is adequate for sharing assets.				

Figure C.2: Composite Q-sort for factor 2 (KADE v1.2.0)

Composite Q sort for Factor 3

-4	-3	-2	-1	0	1	2	3	4
✳✳◀ The current level of data format standardization is generally sufficient for the sharing of assets.	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	✳◀ Even the introduction of road pricing in urban areas won't increase level of asset sharing.	✳ A governmental organization should be in charge of a standardized data sharing platform.	The current level of loading unit standardization in logistics is adequate for sharing assets.	✳✳▶ Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	✳✳▶ Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.
✳✳◀ Strong long lasting client relationships can not be sustained with a system based on asset sharing.	✳✳◀ Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	✳ Municipalities should regulate urban freight logistics more to tackle ustainabilities but it should be nationally coordinated.	✳✳▶ Difference in data formats on loading units is currently a major barrier to asset sharing.	✳▶ The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.
	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	A disruption in the logistics sector is needed to make companies share their data.	Most logistics companies are not digitally ready for data sharing while they should be.	An open platform for asset sharing causes better competition instead of forming a monopoly.	
		Standardization of smaller loading units should be introduced by a governmental organization.	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	An open platform where logistics service demand and supply meet will be the future of logistics.	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.		
			✳ An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.			
				Size standardization of smaller loading units will accelerate the sharing of assets.				

Figure C.3: Composite Q-sort for factor 3 (KADE v1.2.0)

Composite Q sort for Factor 4

-4	-3	-2	-1	0	1	2	3	4
Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	Standardization of smaller loading units should be introduced by a governmental organization.	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	✳✳ Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Municipalities should regulate urban freight logistics more to tackle ustainabilities but it should be nationally coordinated.
✳◀ An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	✳◀ Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	The current level of loading unit standardization in logistics is adequate for sharing assets.	✳ Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	An open platform where logistics service demand and supply meet will be the future of logistics.
	✳✳◀ The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	Size standardization of smaller loading units will accelerate the sharing of assets.	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	An open platform for asset sharing causes better competition instead of forming a monopoly.	
		✳✳◀ Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Difference in data formats on loading units is currently a major barrier to asset sharing.	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	A governmental organization should be in charge of a standardized data sharing platform.	Most logistics companies are not digitally ready for data sharing while they should be.		
			Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	✳ The current level of data format standardization is generally sufficient for the sharing of assets.	A disruption in the logistics sector is needed to make companies share their data.			
				The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs				

Figure C.4: Composite Q-sort for factor 4 (KADE v1.2.0)

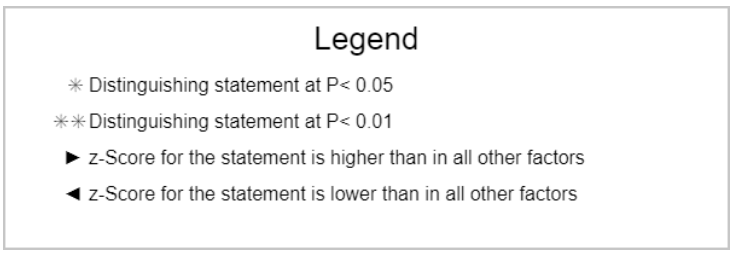

Figure C.5: Legend for composite Q-sorts (KADE v1.2.0)

C.4 DISTINGUISHING STATEMENTS

Table C.2: Distinguishing statements factor 1

Threshold	Q-Sort	#	Statement
P <0.0001	-4	18	Although the margins are small the logistics sector is not being challenged enough to get more efficient.
P <0.0001	-3	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.
P <0.0001	-3	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.
P <0.0001	-2	8	Most logistics companies are not digitally ready for data sharing while they should be.
P <0.01	-2	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.
P <0.005	-1	3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.
P <0.05	-1	33	The current level of data format standardization is generally sufficient for the sharing of assets.
P <0.01	0	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.
P <0.05	0	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.
P <0.05	1	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.
P <0.0001	3	28	Size standardization of smaller loading units will accelerate the sharing of assets.
P <0.0001	3	30	Standardization of smaller loading units should be introduced by a governmental organization.
P <0.0005	4	31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.

Table C.3: Distinguishing statements factor 2

Threshold	Q-Sort	#	Statement
P <0.0001	-4	22	A governmental organization should be in charge of a standardized data sharing platform.
P <0.0001	-4	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.
P <0.0001	-3	11	A disruption in the logistics sector is needed to make companies share their data.
P <0.01	-3	6	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.
P <0.05	-2	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.
P <0.001	-1	19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.
P <0.005	-1	23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.
P <0.0001	0	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.
P <0.05	0	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.
P <0.0005	2	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.
P <0.05	2	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.
P <0.0001	4	33	The current level of data format standardization is generally sufficient for the sharing of assets.
P <0.001	4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.

Table C.4: Distinguishing statements factor 3

Threshold	Q-Sort	#	Statement
P <0.001	-4	33	The current level of data format standardization is generally sufficient for the sharing of assets.
P <0.01	-4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.
P <0.0005	-3	1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.
P <0.05	-2	5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.
P <0.05	-1	22	A governmental organization should be in charge of a standardized data sharing platform.
P <0.05	-1	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.
P <0.005	1	18	Although the margins are small the logistics sector is not being challenged enough to get more efficient.
P <0.05	1	19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.
P <0.01	2	27	Difference in data formats on loading units is currently a major barrier to asset sharing.
P <0.05	3	17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs
P <0.0005	4	3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.

Table C.5: Distinguishing statements factor 4

Threshold	Q-Sort	#	Statement
P <0.05	-4	23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.
P <0.01	-3	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.
P <0.0001	-2	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.
P <0.05	-2	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.
P <0.05	0	33	The current level of data format standardization is generally sufficient for the sharing of assets.
P <0.005	1	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.
P <0.05	1	31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.

C.5 CONSENSUS-DISAGREEMENT BETWEEN FACTORS

	Statement	1	2	3	4	Variance
29	The current level of loading unit standardization in logistics is adequate for sharing assets.	0	0	0	0	0,04
9	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.	1	2	1	2	0,075
10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	-1	-3	-1	-2	0,112
4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	2	3	0	1	0,142
21	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	-2	0	-2	-1	0,173
17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	1	1	3	0	0,192
5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	0	-1	-2	0	0,207
6	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	-1	-3	0	-1	0,231
27	Difference in data formats on loading units is currently a major barrier to asset sharing.	0	-2	2	-1	0,297
20	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	-1	1	0	3	0,353
23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	-2	-1	-2	-4	0,399
26	An open platform for asset sharing causes better competition instead of forming a monopoly.	0	-2	3	3	0,399
24	An open platform where logistics service demand and supply meet will be the future of logistics.	3	1	1	4	0,4
28	Size standardization of smaller loading units will accelerate the sharing of assets.	3	1	0	0	0,409
25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	-4	0	-1	-3	0,474
8	Most logistics companies are not digitally ready for data sharing while they should be.	-2	3	2	2	0,49
13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	-3	0	-3	-4	0,49
14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	1	-2	-1	-3	0,508
2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	0	3	2	-2	0,51
3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	-1	1	4	2	0,554
19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	2	-1	1	4	0,621
1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	1	-1	-3	2	0,654
31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	4	0	-1	1	0,666
18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	-4	-1	1	-1	0,798
16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	4	0	4	-1	0,834
32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	0	2	-3	-2	0,85
12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	1	2	3	-2	0,913
11	A disruption in the logistics sector is needed to make companies share their data.	2	-3	1	1	0,939
15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	-3	2	0	0	0,942
22	A governmental organization should be in charge of a standardized data sharing platform.	2	-4	-1	1	1,276
30	Standardization of smaller loading units should be introduced by a governmental organization.	3	-2	-2	-3	1,396
33	The current level of data format standardization is generally sufficient for the sharing of assets.	-1	4	-4	0	1,401
7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	-2	4	-4	1	1,828
34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	-3	-4	2	3	2,431

Figure C.6: Consensus-disagreement on statements between factors (KADE v1.2.0)

C.6 DISTINGUISHING AND EXTREME STATEMENTS

Table C.6: Distinguishing and extreme statements according to factor 2

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,72	4	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
**	1,61	4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics
	1,298	3	8	Most logistics companies are not digitally ready for data sharing while they should be.	Data sharing	Data
	1,177	3	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Asset sharing	Logistics
	1,166	3	4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	Asset sharing	Market
*	1,13	2	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	General	Societal
**	1,11	2	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	General	Societal
*	-0,82	-2	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	General	Market
**	-1,11	-3	6	Most logistics service providers have the will to share assets but the transition costs are currently not outweighing the benefits.	Asset sharing	Market
	-1,143	-3	10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	Data sharing	Data
**	-1,77	-3	11	A disruption in the logistics sector is needed to make companies share their data.	Data sharing	Data
**	-1,99	-4	22	A governmental organization should be in charge of a standardized data sharing platform.	Stand. Coll.	Market
**	-2,31	-4	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data

Table C.7: Distinguishing and extreme statements according to factor 1

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,71	4	31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Stand. Cont.	Logistics
	1,621	4	16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	General	Logistics
**	1,56	3	28	Size standardization of smaller loading units will accelerate the sharing of assets.	Stand. Cont.	Logistics
	1,464	3	24	An open platform where logistics service demand and supply meet will be the future of logistics.	Stand. Coll.	Logistics
**	1,41	3	30	Standardization of smaller loading units should be introduced by a governmental organization.	Stand. Cont.	Market
*	0,32	1	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
*	0,07	0	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Asset sharing	Logistics
**	0,06	0	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	General	Societal
**	-0,19	-1	3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Asset sharing	Societal
*	-0,54	-1	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
**	-0,6	-2	8	Most logistics companies are not digitally ready for data sharing while they should be.	Data sharing	Data
**	-1,06	-2	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics
**	-1,09	-3	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data
**	-1,51	-3	15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	General	Societal
	-1,608	-3	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
**	-1,74	-4	18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	General	Market
	-1,856	-4	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal

Table C.8: Distinguishing and extreme statements according to factor 3

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
**	1,9	4	3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Asset sharing	Societal
	1,695	4	16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	General	Logistics
	1,203	3	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
*	1,01	3	17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	General	Market
	0,999	3	26	An open platform for asset sharing causes better competition instead of forming a monopoly.	Stand. Coll.	Market
**	0,87	2	27	Difference in data formats on loading units is currently a major barrier to asset sharing.	Stand. Cont.	Data
**	0,77	1	18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	General	Market
*	0,6	1	19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	General	Societal
*	-0,13	-1	22	A governmental organization should be in charge of a standardized data sharing platform.	Stand. Coll.	Market
*	-0,75	-1	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal
*	-1,04	-2	5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	Asset sharing	Societal
	-1,352	-3	32	Postponing certain emission restrictions in urban areas from 2025 to 2030 is needed to keep urban freight logistics affordable.	General	Societal
**	-1,39	-3	1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	Asset sharing	Logistics
	-1,473	-3	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
**	-1,54	-4	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
**	-1,83	-4	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics

Table C.9: Distinguishing and extreme statements according to factor 4

Sig.	Z-score	Q-sort	#	Statement	Characteristic	Dimension
	1,682	4	19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	General	Societal
	1,669	4	24	An open platform where logistics service demand and supply meet will be the future of logistics.	Stand. Coll.	Logistics
	1,568	3	34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	Data sharing	Data
	1,198	3	20	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	General	Logistics
	1,016	3	26	An open platform for asset sharing causes better competition instead of forming a monopoly.	Stand. Coll.	Market
*	0,59	1	31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	Stand. Cont.	Logistics
**	0,59	1	7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	Asset sharing	Logistics
*	0,07	0	33	The current level of data format standardization is generally sufficient for the sharing of assets.	Asset sharing	Data
*	-0,69	-2	2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	Asset sharing	Logistics
**	-1,25	-2	12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	Data sharing	Data
	-1,573	-3	30	Standardization of smaller loading units should be introduced by a governmental organization.	Stand. Cont.	Market
	-1,601	-3	25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	Stand. Coll.	Societal
**	-1,64	-3	14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	General	Market
	-1,919	-4	13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	General	Societal
*	-1,93	-4	23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	Stand. Coll.	Market

C.7 AVERAGE RANKS ON STATEMENTS

Table C.10: Average ranks per statement

#	Statements	Rank
24	An open platform where logistics service demand and supply meet will be the future of logistics.	1,31
19	Municipalities should regulate urban freight logistics more to tackle unsustainabilities but it should be nationally coordinated.	1,14
16	The biggest inefficiencies in urban freight logistics are caused by shippers and receivers taking care of their own transport.	1,03
4	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	1,00
8	Most logistics companies are not digitally ready for data sharing while they should be.	1,00
28	Size standardization of smaller loading units will accelerate the sharing of assets.	0,79
31	Standardization of smaller sized loading units will lead to higher load factors, especially in urban logistics.	0,79
9	When data sharing proves to yield significant economic benefits suddenly most of the logistics service providers are able to do it.	0,76
2	Sharing distribution centres on the outskirts of cities will remove the need for urban consolidation centres.	0,59
3	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	0,55
26	An open platform for asset sharing causes better competition instead of forming a monopoly.	0,45
1	Sharing assets in urban logistics is very complicated due to an abundance of client specific services that are currently offered.	0,41
27	Difference in data formats on loading units is currently a major barrier to asset sharing.	0,38
12	Some say the fear of sharing competitive information is a big barrier to sharing data but in reality this isn't the major problem.	0,34
20	Pilots that are done to improve urban logistics are mostly executed with small volumes and have a small chance of succeeding.	0,34
17	The reason why shippers and receivers provide their own transport is mainly because they do not see it as extra costs	0,14
15	Zero emission zones are going to provide low emission logistics but will increase total vehicle kilometers.	-0,28
33	The current level of data format standardization is generally sufficient for the sharing of assets.	-0,28
18	Altough the margins are small the logistics sector is not being challenged enough to get more efficient.	-0,31
7	Strong long lasting client relationships can not be sustained with a system based on asset sharing.	-0,41
34	Municipalities should data sharing obligated, just like the obligation to use zero emission vehicles in the future.	-0,41
10	When data is shared on a large scale the bigger companies are mainly going to benefit from it.	-0,55
5	Even the introduction of road pricing in urban areas won't increase level of asset sharing.	-0,79
21	Municipalities say they want to make urban freight logistics more sustainable but mostly because it looks good.	-0,86
14	The introduction of zero emission zones will exclude the smaller logistics service providers from the urban logistics market.	-0,97
30	Standardization of smaller loading units should be introduced by a governmental organization.	-1,17
23	An open platform where logistics service demand and supply meet will exclude a lot of logistics service providers from the logistics market.	-1,45
25	An open platform for assets sharing will improve efficiency but will ultimately result in decrease of urban livability.	-1,69
13	Urban freight logistics is already quite efficient and does not form a very urgent problem otherwise there would be more regulation already.	-1,83

C.8 EXTREME RANKED STATEMENTS WITH TEXTUAL EXPLANATION (DUTCH)

Gemeente Rotterdam

Table C.11: Extreme ranked statements with textual explanation (Dutch), Gemeente Rotterdam

Rank	Nr.	Statement	Explanation
-4	7.	Sterke relaties met de klant in de logistieke sector kunnen niet behouden worden in een systeem gebaseerd op het delen van assets.	Als de operationele kwaliteit van het systeem van gedeelde assets tenminste hetzelfde niveau heeft als in de huidige situatie, merkt de klant op dat punt geen verschil, hooguit een verbetering. De klantrelatie (en daarmee het onderscheidend vermogen ten opzichte van concurrenten) zal een andere inhoud krijgen, maar kan nog steeds sterk zijn.
-4	21.	Gemeenten zeggen graag iets te willen doen aan het verduurzamen van stadslogistiek maar meestal alleen omdat het goed staat.	Daar wordt een gemeente wel op aangesproken langs democratische weg (gemeenteraadsverkiezingen, vragenuurtje, commissievergaderingen) en via de (al dan niet sociale) media.
4	2.	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	De bestaande capaciteit aan DC (of bedrijfsruimte die daarvoor geschikt te maken zou zijn) moet sowieso eerst volledig en optimaal benut worden voordat er nog meer stedelijke ruimte wordt opgeofferd.
4	9.	Als data delen veel financieel voordeel zou opleveren dan zijn logistieke dienstverleners er ineens wel klaar voor.	Eerder assets delen dan data delen, maar daar de de sleutel naar efficiëntere stadslogistiek ligt volgens mij bij die maatregelen die niet alleen maatschappelijk voordeel opleveren (volksgezondheid, bereikbaarheid), maar ook in een beter bedrijfsresultaat tot uitdrukking komen.

FedEx

Table C.12: Extreme ranked statements with textual explanation (Dutch), FedEx

Rank	Nr.	Statement	Explanation
-4	31.	Standaardisatie van kleine laadeenheden zal zorgen voor hogere beladingsgraden, vooral in stadslogistiek.	Ik verwacht weinig impact van laadeenheden standaardisatie. Dit zou eerder impact hebben in linehaul en air logistiek. In stadslogistiek is bereikbaarheid van het pakket/de pakketten evident. Ruimte speelt minder een rol.
-4	24.	Een open platform waar logistieke vraag en aanbod elkaar vinden is toekomst van de logistieke sector.	Open platform leid tot toename van aanbieders en niet tot efficiëntie verbetering. Kosten zullen lager worden door verkleinen marge. Kwaliteit zal daardoor verminderen.
4	19.	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	Noodzaak verplicht om samen te werken zal er toe leiden dat er minder kilometers gereden zullen worden, dat er minder stops plaatsvinden en minder opstoppingen.
4	16.	De grootste problemen in stadslogistiek ontstaan door verladers en ontvangers die hun eigen transport uitvoeren.	Veel verschillende verladers in één stad veroorzaakt veel gereden kilometers en opstoppingen doordat verschillende voertuigen door dezelfde straten rijden en dezelfde adressen aandoen.

Gemeente Leiden

Table C.13: Extreme ranked statements with textual explanation (Dutch), Gemeente Leiden

Rank	Nr.	Statement	Explanation
-4	33.	Over het algemeen volstaat het huidige standaardisatie niveau van data formats om assets te delen.	juist de verschillende formats belemmeren
-4	2.	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	er zijn altijd verschillende soorten centra nodig voor verschillende stromen (bouw, retail, food, non-food, pakketen) op lokaal en regionaal niveau, daarnaast is afstand en/of actieradius voor LEv danwel elektrische bakgfiets beperkt
4	26.	Een open platform waar logistieke vraag en aanbod elkaar vinden zal eerder zorgen voor betere concurrentie dan voor monopolyvorming.	Het niet (willen) delen van data wordt eerder ingegeven door angst en wantrouwen, een open platform geeft gezonde concurrentie tov een gesloten platform
4	6.	De meeste logistieke dienstverleners zijn wel bereid om assets te delen maar de transitiekosten zijn momenteel te hoog.	er moet veel tijd en moeite in worden geinvesteerd

Gemeente Den Haag

Table C.14: Extreme ranked statements with textual explanation (Dutch), Gemeente Den Haag

Rank	Nr.	Statement	Explanation
-4	11.	Een disruptieve vernieuwing op het digitale vlak is nodig om partijen data te laten delen.	Efficiëntie in vervoerskosten, door transitie naar elektrisch en AI-bestuurde voertuigen. Zie DHL in Londen in Hong Kong met gebruik van drones of in Duitsland met computergestuurde konvooien.
-4	5.	Zelfs door het introduceren van tolheffing op stedelijk vrachtvervoer zal het delen van assets niet toenemen.	Eerder gebruik van bakfietsen, e-scooters en e-steps, al dan niet in combinatie met bestelwagens. Zie pakketbezorgers en taxidiensten in San Fransisco.
4	4.	Verborgen kosten in stadslogistiek maakt eerlijke toekenning van kosten en baten een grote barrière voor het delen van assets.	Deze onzekerheid heeft een zwaar verstorend effect op het vertrouwen tussen bedrijven.
4	8.	De meeste logistieke dienstverleners zijn digitaal niet ver genoeg om data te delen terwijl ze dat eigenlijk wel zouden moet zijn.	Met een logistieke app kan de drempel snel verlaagd worden.

Gemeente Utrecht

Table C.15: Extreme ranked statements with textual explanation (Dutch), Gemeente Utrecht

Rank	Nr.	Statement	Explanation
-4	21.	Gemeenten zeggen graag iets te willen doen aan het verduurzamen van stadslogistiek maar meestal alleen omdat het goed staat.	Oneens, omdat verduurzamen ook betekent dat voertuigen stiller, schoner en kleiner en stadsdistributie slimmer en efficienter. Gevolg, veel minder impact op de leefomgeving met trillingen, stank, geluid, CO_2, verkeersbewegingen, etc. Er zitten dus veel meer kanten aan dan alleen ZE worden.
-4	30.	Een verdere standaardisatie van kleine laadeenheden zal door de overheid moeten worden geïntroduceerd.	Oneens, omdat dit echt voor de markt is. Ieder speelt zijn eigen rol. Overheid is met name om de voorwaarden te scheppen, reguleren en handhaven. Dit soort ontwikkelingen is echt aan de markt.
4	3.	Increased efficiency by sharing assets increases city livability more than changing to zero emission vehicles in urban freight logistics.	Mee eens, omdat alleen het vervangen van een voertuig met verbrandingsmotor naar een elektrische motor evenveel voertuigen blijven rijden op de weg. Zero emissie moet, maar alleen in combinatie met bundelen van goederen en transitie naar andere voer- en vaartuigen (zoals LEVV's en over water).
4	16.	De grootste problemen in stadslogistiek ontstaan door verladers en ontvangers die hun eigen transport uitvoeren.	Mee eens, omdat dit partijen zijn die geen Full-Truck-Load voor 1 stad hebben, niet gespecialiseerd zijn in stadslogistiek, niet de data op orde hebben om te delen en met (vaak) zeer oude voertuigen rijden.

TLN

Table C.16: Extreme ranked statements with textual explanation (Dutch), TLN

Rank	Nr.	Statement	Explanation
-4	34.	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Welke data moet er dan worden gedeeld en hoe ga je dat handhaven? Wel zou het goed zijn als gemeentelijke data kunnen worden gedeeld en ontsloten via een centrale database en - op termijn - kunnen worden gekoppeld aan boordcomputers/-planningssoftware.
-4	30.	Een verdere standaardisatie van kleine laadeenheden zal door de overheid moeten worden geïntroduceerd.	Als standaardisatie van (kleine) laadeenheden (een deel van) de oplossing is voor stadslogistiek, dan gaat de sector de best passende oplossing wel vinden. De 'stadscontainer' zal op termijn wel gaan ontstaan, vergelijk het maar met de zeecontainers.
4	16.	De grootste problemen in stadslogistiek ontstaan door verladers en ontvangers die hun eigen transport uitvoeren.	In tegenstelling tot beroepsgoederenvervoerders (in het bezit van een NIWO-vergunning) mogen deze zogheten 'eigen vervoerders' geen goederen van derden vervoeren. Voor eigen vervoerders is goederenvervoer geen core business, het geld wordt verdiend met de omzet van producten. Bundeling van de goederen (en vervoer via een beroepsgoederenvervoerder) zorgt voor afname van vervoersbewegingen, zowel op de last mile als naar de stad toe.
4	2.	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	Het delen van distributie aan de rand van de stad (of centraal in een regio voor meerdere steden) = een stadshub (of regiohub). Beroepsgoederenvervoerders gespecialiseerd in stadsdistributie, werken vaak samen in netwerken, waarbij 's nachts op een centrale hub de goederen uit heel Nederland worden uitgewisseld om de volgende dag gebundeld in steden te worden uitgeleverd. Is ook te zien in de TLN film 'Een dag in de Nederlandse stadsdistributie' 4 minuten: https://www.youtube.com/watch?v=vPRlTcgtCMU 2 minuten: https://www.youtube.com/watch?v=5-VEOJyTmJU

Gemeente Zwolle

Table C.17: Extreme ranked statements with textual explanation (Dutch), Gemeente Zwolle

Rank	Nr.	Statement	Explanation
-4	2.	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	Ik zie duidelijk een verschil tussen een DC van bijvoorbeeld Wehkamp aan de rand van de stad en een Stadshub aan de rand van de (binnenstad). Daarbij kunnen in een Stadshub ook andere zaken gecombineerd worden (opwek/ opslag energie, deelmobiliteit, sociale functies of parkeren).
-4	14.	De introductie van een zero emissie zone zal vooral de kleinere partijen van de stadslogistieke markt uitsluiten.	In Zwolle kennen we Cycloon. Een bedrijf dat klein begonnen is in een (toen) niche van de markt en nu zeer gerespecteerd is. Slimme ondernemers zullen altijd hun weg vinden.
4	32.	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	Wanneer binnen nu en 4,5 jaar ZES ingevoerd zou worden, kunnen ondernemers voor (grote) kosten worden gesteld. Er moet een acceptabele termijn zijn waarbinnen voertuigen (economisch) afgeschreven kunnen worden. Daarbij zijn er voor grote vrachtwagens nog nauwelijks (betaalbare) ZE-alternatieven
4	31.	Standaardisatie van kleine laadeenheden zal zorgen voor hogere beladingsgraden, vooral in stadslogistiek.	Als kleine laadeenheden worden gestandaardiseerd, is het wellicht eenvoudiger om ook andersoortige voertuigen in te zetten, denk aan bakfietsen etc. In dat geval hoeft er niet een busje de binnenstad in, maar kan het nog duurzamer

DSV

Table C.18: Extreme ranked statements with textual explanation (Dutch), DSV

Rank	Nr.	Statement	Explanation
-4	18.	Ondanks de kleine marges wordt de logistieke sector niet genoeg uitgedaagd om efficiënter te worden.	De logistiek kent vele manieren van aanpakken. Klanten betalen voor een bepaald niveua dienstverlening. Als een klant een laag niveau dienstverlening wilt maar wel het goedkoopste zullen mages laag zijn. Als een klant een hoge kwaliteite en service level wil waarbij hij volledig ontzorgt wordt zullen er betere marges gemakt kunnen worden. Logistiek heeft denk ik hogere marges dan ze laten blijken.
-4	30.	Een verdere standaardisatie van kleine laadeenheden zal door de overheid moeten worden geïntroduceerd.	Dit grenst aan overregulering. Laadeenheden die niet in de standaard passen gaan juist zorgen voor meer volume. Een prikkel op volume basis i.p.v. gewicht zou een driver kunnen zijn om de verpakkingen zo klein mogelijk te maken. Een slim algoritme, dat door het delen van data weet wat voor laadeenheden er aan komen kan zo al de meest efficiente belading berekenen. Standardisatie is alleen nodig als het een manueel proces is en er geen forecast is.
4	22.	Vanuit de overheid moet er een platform worden ontwikkeld om gestandaardiseerd data te kunnen delen.	Dit bestaat al, iShare. Ontwikkeld vanuit de topsector logisitek. Mocht je contactpersoenen willen hebben kan ik dezr voor je verzorgen.
4	1.	Het delen van assets in stadslogistiek is erg gecompliceerd door klant specifieke diensten die worden geleverd.	Het gaat niet alleen om vervoer, maar ook over kwaliteit en communicatie. Verladers kiezen in sommige gevallen ook voor duurder transport omdat er met een vaste partij betere afspraken over kwaliteit gemaakt kunnen worden. Het delen van assets zorgt voor een gecompliceerdere verdeling van verantwoordelijkheid. Als ik een KPI met een klant afspreek over leveringszekerheid zal ik het liever zelf willen leveren i.p.v. meegeven met een conculega, ookal is dat efficienter. Als hij het verpest moet ik op de blaren zitten. Kwaliteit is soms belangrijker als effectivitiet.

Evofenedex

Table C.19: Extreme ranked statements with textual explanation (Dutch), Evofenedex

Rank	Nr.	Statement	Explanation
-4	14.	De introductie van een zero emissie zone zal vooral de kleinere partijen van de stadslogistieke markt uitsluiten.	Oneens; dit geeft juist ruimte voor nieuwkomers die zich specialiseren.
-4	22.	Vanuit de overheid moet er een platform worden ontwikkeld om gestandaardiseerd data te kunnen delen.	Gebruik bestaande data en bronnen en ga niet (weer) een nieuw platform oprichten. Het NLIP is ook nooit van de grond gekomen. Ik vind deze gedachte ouderwets.
4	34.	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Dat delen is randvoorwaardelijk. Verplichting helpt hierbij.
4	18.	Ondanks de kleine marges wordt de logistieke sector niet genoeg uitgedaagd om efficiënter te worden.	De huidige beladingsgraad laat nog steeds te wensen over. Er moet dus wat gebeuren om te innoveren!

PostNL

Table C.20: Extreme ranked statements with textual explanation (Dutch), PostNL (1)

Rank	Nr.	Statement	Explanation
-4	23.	Een open platform waar logistieke vraag en aanbod elkaar vinden zal veel logistieke dienstverleners uitsluiten van de markt.	Omdat 'iedereen' aangesloten kan zijn op dit platform. Voorbeeld; ben je een logistiek dienstverlener die normaliter alleen bouwmaterialen distribueert, kun je met een open platform ook andere stromen vervoeren (mits je voertuig dat toelaat/de juiste specs heeft).
-4	25.	Een open platform voor de logistieke markt zorgt voor een hogere efficiëntie maar zal leiden tot een lagere leefbaarheid in de stad.	Het post en pakketten netwerk is bijvoorbeeld al super efficient. 5/7% van de vervoersbewegingen is afkomstig van post en pakket stromen. En deze busjes zitten ook nog eens vol. Ze gaan dus niet voor niks de stad in! De sorteercentra zijn daarbij ook al soort 'stadshubs' waar de routes op de meest efficiënte manier worden ingepland. Daarnaast heeft PostNL bijvoorbeeld 65% marktaandeel in de e-commerce markt. Gaat PostNL dit netwerk openstellen op een open platform. Dan kunnen de routes niet meer efficiënt worden ingepland omdat iedereen ineens de logistiek kan uitvoeren. Kijk je naar leefbaarheid, PostNL bepaalt welk type vervoersmiddel het beste kan worden ingezet voor welk deel in de stad, voor welk type pakket. Indien allerlei aanbieders stromen kunnen gaan vervoeren krijg je dus en inefficiente routes, en gaat een fietskoerier misschien wel pakketten op de fiets bezorgen in buiten gebieden waar het gebied bezorgen met een elektrische bestelbus nog prima toe laat. En andersom, gaat dan ineens een bestelbus van bijvoorbeeld een bouwbedrijf pakketjes distribueren in gebieden waar je simpelweg niet meer met een bestelbus wil rijedn (historische binnenstad, veel toerisme, smalle straten etc). Als daar geen regulering voor is, de aannemer extra geld kan verdienen door zo'n rit te rijden met zijn eigen bus leidt dit tot 1. minder efficiente routes, en 2. lagere leefbaarheid. Het gaat dus hand in hand; welk type vervoersmiddel, voor welk type pakket/goederen stroom, in welk gebied, op welk moment van de dag.

Table C.21: Extreme ranked statements with textual explanation (Dutch), PostNL (2)

Rank	Nr.	Statement	Explanation
4	19.	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	Iedere gemeente mag zelf bepalen; wat wordt de omvang van de ZE zone, wat wordt de omvang van de autoluwe zone. Gemeenten zetten kleinschalig met het idee deze zones te vergroten in de aanloop naar 2030. Dit betekent veel voor bedrijven in de logistiek die grote investeringen moeten doen (elektrische bestelbussen, licht elektrisch vervoer). Deze investeringen wil je in korte tijd kunnen terugverdien. Ook de impact op interne bedrijfsvoering (per stad een ander ontwerp moeten maken). Een omvangrijke Zero Emissie zone leidt tot een kansrijke business case. We kijken hiervoor naar verschillende aspecten; (A) de gemeentelijke kosten van het invoeren en handhaven van de zone, (B) de kosten voor burgers en bedrijven, (C) de opbrengsten van schone lucht en klimaat en (D) becijfering van de impact op bezoekers in het stadcentrum en de logistiek. Ook uit onderzoek blijkt dat een grotere Zero Emissie zone leidt tot hogere maatschappelijke baten voor luchtkwaliteit en klimaat. Daarnaast wordt er een eerlijk speelveld gecreëerd voor alle bedrijven in de (binnen)stad, en biedt het potentieel (zakelijk) volume voor stadshubs. Maar ook nationaal gecoordineerde regulering op bundeling stimuleert duurzame stadslogistiek. En nationaal gecoordineerde regulering op het bundelen van inkoopkracht in gebieden zorgt voor zakelijk volume (van bedrijven, cultuurinstellingen, gemeentes, etc) voor stadshubs.
4	4.	The hidden costs in logistics make fair assignment of costs and benefits a major barrier for asset sharing concepts.	Een stadshub zorgt voor een extra schakel in de keten. Met veel volume via een stadshub kun je een groene business case krijgen. Maar dit inzicht in (maatschappelijke) kosten en baten in lastig. Wie 'dekt' de kosten voor de duurzame last mile bijvoorbeeld. Elektrische voertuigen zijn nog veel duurder. Met schaalvoordelen kun je die kosten mogelijk dekken, maar het inzicht (door zo veel verschillende schakels in de keten) in kosten en baten heeft de logistieke sector nog niet scherp.

Breytner

Table C.22: Extreme ranked statements with textual explanation (Dutch), Breytner

Rank	Nr.	Statement	Explanation
-4	32	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	De transitie naar een duurzaam model voor stadslogistiek (schoner en efficiënter) zal alleen plaatsvinden door stringente regulering of ruimhartige stimulering (goedkoper dan conventioneel) anders komt de markt niet in beweging
-4	5	Zelfs door het introduceren van tolheffing op stedelijk vrachtvervoer zal het delen van assets niet toenemen.	Tolheffing zou juist een instrument kunnen zijn (regulering) om te sturen op efficiëntie en inzet schonere vervoersmiddelen
4	19	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	Uniformiteit zorgt voor een groter marktpotentieel en daarmee een grotere slagingskans
4	12	Het gevaar op delen van concurrentiegevoelige informatie zou een barrière zijn voor het delen van data maar in de praktijk valt dat mee.	Markt toetreding tot de transport en logistiek branche is zeer laagdrempelig en wordt met name gekenmerkt door concurrentie op prijs. Lage professionaliseringsgraad zorgt ervoor dat delen van informatie als bedreiging wordt gezien.

Euser

Table C.23: Extreme ranked statements with textual explanation (Dutch), Euser

Rank	Nr.	Statement	Explanation
-4	32	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	Er zal een besef moeten ontstaan dat als jij je goederen tot de deur afgeleverd wilt hebben, er hier een prijskaartje aan hangt. Goed voorbeeld in Amsterdam was vanuit leveranciers van bouwmaterialen dat er geen verschil zit in afleverkosten bij een bouwhub aan de rand van de stad of afleveren op de gracht in het centrum....
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Met name in pakketbezorging valt een hoop te behalen. DPD, DHL, GLS, UPS etc rijden achter elkaar dezelfde straten in om pakketten te bezorgen. Enige vorm van synergie is daarin ver te zoeken.
4	31	Standaardisatie van kleine laadeenheden zal zorgen voor hogere beladingsgraden, vooral in stadslogistiek.	momenteel versnippering met rolcontainers, blokpallets, europallets. Palletgoed en rolcontainers zijn moeilijk te combineren. Zeker als het ook nog gaat om geconditioneerd transport met twee temperatuurzones
4	19	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	In de ontheffingsverlening maar ook projecten is elke gemeente voor zichzelf bezig. Voorbeeld is Maastricht nu een project over het ”stekkeren” van koelmotoren, Dit is al eerder geprobeerd in andere gemeentes. Daanaast per gemeente andere aanvraagprocedure om de stad te mogen betreden. De één volstaat met kenteken en bedrijfsnaam, de ander login middels E-herkenning en uploaden van vrachtdocumenten, een derde wil kopie kentekencard bij de aanvraag, etc.

DPD

Table C.24: Extreme ranked statements with textual explanation (Dutch), DPD

Rank	Nr.	Statement	Explanation
-4	3	Het delen van assets heeft potentieel een positievere impact op leefbaarheid in de stad dan veranderen naar zero emissie voertuigen.	Dat is niet waar. Een inefficiënt systeem met 100% zero emissie voertuigen is zero emissie! Daarbij denk ik dat luchtkwaliteit een groter probleem is dan congestie.
-4	18	Ondanks de kleine marges wordt de logistieke sector niet genoeg uitgedaagd om efficiënter te worden.	40 Zero emissie zones per 2025 is een grote uitdaging.
4	31	Standaardisatie van kleine laadeenheden zal zorgen voor hogere beladingsgraden, vooral in stadslogistiek.	Als ik zie wat voor een pakketten er in de praktijk langs komen is dit zeker waar.
4	2	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	vanuit de rand van de stad zijn de centra elektrisch te bereiken, en je hebt geen inefficiënte overlaadstap nodig.

Netwerk Benelux

Table C.25: Extreme ranked statements with textual explanation (Dutch), Netwerk Benelux

Rank	Nr.	Statement	Explanation
-4	22	Vanuit de overheid moet er een platform worden ontwikkeld om gestandaardiseerd data te kunnen delen.	Vaak is de overheid te traag en te complex voor het bedrijfsleven
-4	34	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Alle gemeenten hebben hun eigen regels en verplichtingen. Dit is te lastig voor het bedrijfsleven
4	32	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	Er zijn nu nog te weinig (betaalbare) zero emissie voertuigen beschikbaar
4	33	Over het algemeen volstaat het huidige standaardisatie niveau van data formats om assets te delen.	Reeds bestaand netwerken van vervoerders zijn hier een voorbeeld van

Bode-Scholten

Table C.26: Extreme ranked statements with textual explanation (Dutch), Bode-Scholten

Rank	Nr.	Statement	Explanation
-4	34	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Gemeenten moeten zich niet bemoeien met dit soort zaken, Ga niet op de stoel van ondernemers zitten. Er zijn plenty voorbeelden waar gemeenten dit hebben gedaan, wat allemaal een fiasco is geworden. Zie de voorbeelden voor stadshubs met veel subsidies, die allemaal weer gesloten zijn.
-4	22	Vanuit de overheid moet er een platform worden ontwikkeld om gestandaardiseerd data te kunnen delen.	Overheid moet zich hier niet mee bemoeien. Stop met subsidie regelingen want als de pot leeg is, stopt het initiatief.
4	15	Zero emissie zones zullen zorgen voor een lagere uitstoot maar voor een verhoging van het totaal aantal voertuigkilometers.	Veel partijen zullen maar 1 ze voertuig aanschaffen om dat gebied te leveren.
4	2	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	Ik trek hem breder naar regionale DC's.

PARCLS.com

Table C.27: Extreme ranked statements with textual explanation (Dutch), PARCLS.com

Rank	Nr.	Statement	Explanation
-4	26	Een open platform waar logistieke vraag en aanbod elkaar vinden zal eerder zorgen voor betere concurrentie dan voor monopolyvorming.	Dat is zeer onjuist, omdat de grootte van een logistiek dienstverlener namelijk bepaalt hoe efficiënt deze is. Dus met een open platform, waar de kostprijs altijd doorslaggevend zal zijn - zullen de grote partijen groter worden en kleine partijen die nooit de efficiency graad kunnen behalen - delven het onderspit. Beter is het dan om alles te nationaliseren en er weer een staatsbedrijf van te maken.
-4	15	Zero emissie zones zullen zorgen voor een lagere uitstoot maar voor een verhoging van het totaal aantal voertuigkilometers.	incorrect. Praktijk wijst anders uit.
4	16	De grootste problemen in stadslogistiek ontstaan door verladers en ontvangers die hun eigen transport uitvoeren.	Ontvangende partijen moeten met meer leveringen rekening houden. Dit leidt tot in 30% van de gevallen 50% kans op unsuccessful deliveries. Daardoor ontstaan weer extra vervoersbewegingen terug naar DC en volgende dag poging 2. Beter is om op de last mile te bundelen zoals Parcls.com dat doet. Daarmee nemen vervoersbewegingen significant en aantoonbaar af in de binnensteden.
4	19	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	Klopt. Teveel is het een lappendeken van kleinschalige - goedbedoelde - projecten.

Gemeente Amsterdam

Table C.28: Extreme ranked statements with textual explanation (Dutch), Gemeente Amsterdam

Rank	Nr.	Statement	Explanation
-4	25	Een open platform voor de logistieke markt zorgt voor een hogere efficiëntie maar zal leiden tot een lagere leefbaarheid in de stad.	Efficient betekent naar mijn mening zeker niet perse 'niet duurzaam'. Hoe efficiënter de stadslogistiek mogelijk ook des te minder vervoersbewegingen (met lage beladingsgraad).
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Zeker een probleem, je kan er niet omheen. Geluid, trillingen, uitstoot, gewicht (effect op kwetsbaarheid kades en bruggen), congestie etc. Wel mn problematiek te 'voelen' in de binnenstad, omdat hier op dit moment de druk op de openbare ruimte vaak het grootst is.
4	24	Een open platform waar logistieke vraag en aanbod elkaar vinden is toekomst van de logistieke sector.	Naar verwachting blijft het aantal logistieke bewegingen de komende jaren toenemen. Aan de andere kant raken mn de (binnen)steden vol. En wordt de openbare ruimte nog meer waard, denk alleen al aan het inperken van bijvoorbeeld het aantal parkeerplekken in de binnenstad, of multifunctioneel gebruik van de openbare ruimte door de dag heen. En speelt duurzaamheid een steeds belangrijkere rol. Waarbij dit ook steeds meer als een 'must' gezien wordt met regulering tot gevolg. Dit vraagt om een manier waarop aanbieders (verplicht) efficiënter aan de slag gaan en elkaar nodig hebben, omdat ze zelf niet (altijd) alle 'tools' in bezit hebben.
4	14	De introductie van een zero emissie zone zal vooral de kleinere partijen van de stadslogistieke markt uitsluiten.	Ze hebben vaak niet de financiële buffers om zelfstandig duurzamere vervoermiddelen aan te schaffen en zijn meer afhankelijk van bv. subsidies (of in dit geval samenwerking met andere (kleinere) partijen).

GS1

Table C.29: Extreme ranked statements with textual explanation (Dutch), GS1

Rank	Nr.	Statement	Explanation
-4	1	Het delen van assets in stadslogistiek is erg gecompliceerd door klant specifieke diensten die worden geleverd.	De afleveradressen hebben vaak helemaal geen specifieke eisen aan de assets (dozen/pallets/rolkarren) waarmee de goederen worden afgeleverd. Vooral kleinere locaties (en dat zijn de meeste afleveringen) stellen vaak weinig / geen eisen zolang de assets ook weer snel worden afgehaald (men heeft vaak weinig ruimte om de assets tijdelijk op te slaan).
-4	33	Over het algemeen volstaat het huidige standaardisatie niveau van data formats om assets te delen.	Helaas is het meestal nog steeds zo dat elke verlader en elke vervoerder zijn eigen data formats (en ook labels) toepast. Daardoor wordt het vaak noodzakelijk om bij overdracht van de dozen/pallets ook de labels te vervangen, met verschillende mobiele devices te werken en/of handmatig transport informatie opnieuw in systemen in te geven. Dat maakt het consolideren van afleveringen naar de binnenstad zeer arbeidsintensief en foutgevoelig, waardoor de consolidatie (bundeling van flows) voor de verladers noch de ontvanger nog erg interessant is/lijkt
4	16	De grootste problemen in stadslogistiek ontstaan door verladers en ontvangers die hun eigen transport uitvoeren.	Als elke verlader zelf zijn bestellingen uitlevert komt er vaak meerdere malen per dag een kleine aflevering aan bij de ontvanger vaak op heel ongelegen tijdstippen. Voor de ontvanger zou het veel makkelijker zijn als er slechts een geconsolideerde aflevering kwam. Ideaal zou die ene aflevering gebeuren op een tijdstip dat de ontvanger goed uitkomt. Het spiegelbeeld geld voor leveranciers die dagelijks grote aantallen kleine afhalingen zien die in proncipe ook in één keer konden worden opgehaald en dan gedistribueerd.
4	27	Verschillende data formats op laadeenheden vormen een grote barrière voor het delen van assets.	Een StadsHub die voor meerdere vervoerders of verladers een geconsolideerde aflevering in de stad wil doen moet momenteel soms/vaak met meerdere label-formaten werken en ook met diverse mobiele toestellen van vervoerders on die ene geconsolideerde aflevering te kunnen afwerken. Dat is zeer arbeidsintensief en ook foutgevoelig. Op die manier kan een StadHub nooit effectief / efficiënt werken op enige schaal.

CityHub

Table C.30: Extreme ranked statements with textual explanation (Dutch), CityHub

Rank	Nr.	Statement	Explanation
-4	23	Een open platform waar logistieke vraag en aanbod elkaar vinden zal veel logistieke dienstverleners uitsluiten van de markt.	Als het open is, is er voor een ieder een kans. Soms als vervoerder, maar soms ook als opdrachtgever. Logistieke dienstverleners die zich niet willen voorbereiden sluiten zichzelf af van de markt, dat doet niet het systeem.
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Is natuurlijk grote onzin. Zolang er nog met minimale marges van 3 tot 5 procent wordt gereden, logistiek medewerkers in een zzp constructie zonder duurzaam toekomstbeeld worden geduwd en met oude dieselbussen rond moeten rijden is er zeker geen sprake van een constructief duurzaam model. Daarnaast gebeuren er dagelijks ernstige ongelukken in stedelijke omgeving (ong 360 per jaar in NL) en heeft de ontvanger niet veel te zeggen over wie er bij hem aan de deur komt. Picnic voor de boodschappen, tablet van Coolblue, boek van Bol.com en je koffie van Nespresso levert 4 leveringen op hetzelfde adres op (Picnic, Coolblue, PostNL en DHL). Op zichzelf zijn die efficiënt (PostNL lost 18 pakjes per uur), maar samenwerking zal altijd marge verhogen. Nu is het resultaat, dat de busjes niet worden geparkeerd, blijven draaien met ronkende motor en innovatie lastig is, omdat ze anders hun norm niet halen.
4	24	Een open platform waar logistieke vraag en aanbod elkaar vinden is toekomst van de logistieke sector.	Zonder deze matching van vraag en aanbod gaat het aantal transportbewegingen enorm toenemen in de stad. Zelfs als dat zero emissie wordt (wat slecht betaalbaar is voor veel spelers) wordt het onbetaalbaar door slechtere bereikbaarheid en meer verkeersdruk. Innovatie op dit vlak is noodzaak om het betaalbaar te houden. Niet alle spelers (vooral de groten) zullen hier klaar voor zijn, dus het moet disruptief.
4	11	Een disruptieve vernieuwing op het digitale vlak is nodig om partijen data te laten delen.	Grote spelers in parcels zullen hier niet vrijwillig in samenwerken (DHL, PostNL, etc). Het moet dus disruptief worden aangepakt, waarbij ontvangers van zendingen aan de knoppen gaan draaien. De kans is groot dat de grote spelers het pas laat door gaan krijgen.

Vervoerregio Amsterdam

Table C.31: Extreme ranked statements with textual explanation (Dutch), Vervoerregio Amsterdam

Rank	Nr.	Statement	Explanation
-4	34	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Dit moet echt aan de markt zelf overgelaten worden. De overheid kan wel zelf een data platform oprichten.
-4	33	Over het algemeen volstaat het huidige standaardisatie niveau van data formats om assets te delen.	Er moeten nog grote stappen gezet worden in digitalisering van de logistiek. Begin eerst bijvoorbeeld met de digitalisering van de vrachtbrief. Slechts een paar procent is nu digitaal!
4	24	Een open platform waar logistieke vraag en aanbod elkaar vinden is toekomst van de logistieke sector.	Dit geldt vooral voor kleinere leveringen en voor verladers die zelf vervoeren. De last mile zal steeds duurder worden door reguleringen en toenemende vertragingen in stedelijke gebieden. Een open platform zal zorgen voor consolidatie en efficiency in de stadslogistiek.
4	20	De pilots die worden gedaan in stadslogistiek zijn meestal met kleine volumes en hebben daardoor een kleine kans van slagen.	De investeringen wegen vaak niet op tegen de voordelen, zelfs niet als er veel privileges worden toegekend. Dit heeft ook te maken met de lage marges in de logistiek, je hebt echt volume nodig om te kunnen renderen.

HAVI Logistics

Table C.32: Extreme ranked statements with textual explanation (Dutch), HAVI Logistics

Rank	Nr.	Statement	Explanation
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Disruptie gaat alleen door regulering van de overheid komen, niet grootschalig vanuit de markt. Stadslogistiek is in mijn ogen niet zo inefficient als het populaire standpunt wat nu wordt geroepen, wel gaat het pas efficiënter worden als er meer regulering komt. Laat de overheid een kader scheppen, de markt het oplossen in welke systemen toe te passen.
-4	3	Het delen van assets heeft potentieel een positievere impact op leefbaarheid in de stad dan veranderen naar zero emissie voertuigen.	In een groeiende logistieke markt voor zowel retail, horeca en home-delivery is misschien delen van assets een korte klap, maar uiteindelijk gaat het erom dat dat voertuig wat daar blijft staan stil en uitstootarm is. Leefbaarheid definieer is daarmee vooral in luchtkwaliteit en geluidsvervuiling. Op korte termijn zal zero-emissie alleen beschikbaar/ te betalen zijn in kleine voertuigen die relatief minder kunnen meenemen dan een volle vrachtwagen = meer voertuigkilometers met 6 busjes ipv 1 motorwagen. Zorg dus dat die motorwagen stil en zero-emissie wordt en je lost op termijn de kern van het probleem op (icm slimme losuren).
4	8	De meeste logistieke dienstverleners zijn digitaal niet ver genoeg om data te delen terwijl ze dat eigenlijk wel zouden moet zijn.	Traditioneel sterk in wielen en diesel, opkomst van data intern neemt pas net een echte vlucht laat staan het delen van data.
4	2	Het delen van distributiecentra aan de rand van de stad zou stadshubs overbodig maken.	Als je goederen door hetzelfde DC laat stromen gaat het delen van de assets om iets te leveren makkelijker worden. DC's aan randen van steden zijn ingericht op piekstromen die ze maar 1x per dag hoeven te leveren om sochtends leeg te geraken. Capaciteit in de overige 16 uur van de dag gebruiken voor anderen zou een deel van de vraag naar extra stadhubs overbodig maken.

Ministerie van I&W

Table C.33: Extreme ranked statements with textual explanation (Dutch), Ministerie van I&W

Rank	Nr.	Statement	Explanation
-4	32	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	De extra kosten vallen mee, de TCO van elektrische vrachtwagens nadert snel van dieselvrachtwagens. Uitstel zorgt voor stilstand richting duurzame stadslogistiek.
-4	17	Veel verladers en ontvangers voeren hun eigen transport uit omdat ze het niet als extra kosten ervaren.	Bedrijven zijn zeer kostenbewust en efficiënt, zij zullen niet snel kostenvoordelen over het hoofd zien. Er zijn genoeg inkopers en consultants die dit onderzoeken en implementeren. Veel verladers (b.v. AH) besteden het vervoer reeds uit.
4	11	Een disruptieve vernieuwing op het digitale vlak is nodig om partijen data te laten delen.	Ik denk dat een partij als Uber of andere vernieuwende oplossing de markt kan opschudden.
4	12	Het gevaar op delen van concurrentiegevoelige informatie zou een barrière zijn voor het delen van data maar in de praktijk valt dat mee.	De logistiek van bedrijven is veelal zeer efficiënt en gefocused op eigen organisatie. samenwerking met andere partijen is ook lastig,, extra overslag is zeer kostbaar.

Gemeente Enschede

Table C.34: Extreme ranked statements with textual explanation (Dutch), Gemeente Enschede

Rank	Nr.	Statement	Explanation
-4	30	Een verdere standaardisatie van kleine laadeenheden zal door de overheid moeten worden geïntroduceerd.	Kan de markt ook prima zelf lijkt me.
-4	23	Een open platform waar logistieke vraag en aanbod elkaar vinden zal veel logistieke dienstverleners uitsluiten van de markt.	Juist kleinere partijen krijgen zo de kans om een vrachtje mee te pikken op bv hun terugweg, waardoor het ook voor hen juist voordelen biedt.
4	20	De pilots die worden gedaan in stadslogistiek zijn meestal met kleine volumes en hebben daardoor een kleine kans van slagen.	Pilots zouden vooral technische haalbaarheid moeten toetsen. Voor een financieel haalbaar verhaal heb je meer massa nodig. Dus moet er een radicale keuze worden gemaakt en daarop strikter (met meer regels/verboden) worden ingezet.
4	19	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	Markt heeft zelf onvoldoende belang in zaken als duurzaamheid en leefbaarheid.

UPS

Table C.35: Extreme ranked statements with textual explanation (Dutch), UPS

Rank	Nr.	Statement	Explanation
-4	30	Een verdere standaardisatie van kleine laadeenheden zal door de overheid moeten worden geïntroduceerd.	op dit gebied is het niet aangewezen dat de overheid een rol van betekenis speelt. die moet faciliterend zijn en niet beperkend
-4	18	Ondanks de kleine marges wordt de logistieke sector niet genoeg uitgedaagd om efficiënter te worden.	het zijn net de kleine marges die transporteurs dwingen om creatief te zijn. in de huidige context betekent dat efficiëntie (en dus duurzaam) wat leidt tot minder kosten
4	19	Er moet meer nationaal gecoördineerde regulering komen vanuit gemeenten om stadslogistiek duurzamer te maken.	landelijk of minstens regionaal is het zinvol om harmonisering na te streven, aangezien een dienstverlener verschillende steden bedient vanuit een distributiecentrum. harmonisering is dan nuttig (vanuit organisatorisch standpunt) en duidelijk (vanuit regelgevend perspectief)
4	1	Het delen van assets in stadslogistiek is erg gecompliceerd door klant specifieke diensten die worden geleverd.	het delen van assets kan een optie zijn, maar dient niet opgelegd te worden door overheden bij het nastreven van efficientie komt de optie van delen van assets sowieso in beeld; indien dat uiteindelijk niet gebeurt, dan is dat te wijten aan gebrek aan voordelen voor die specifieke operator(s)

Gemeente Zaanstad

Table C.36: Extreme ranked statements with textual explanation (Dutch), Gemeente Zaanstad

Rank	Nr.	Statement	Explanation
-4	7	Sterke relaties met de klant in de logistieke sector kunnen niet behouden worden in een systeem gebaseerd op het delen van assets.	Klantrelaties zijn nu nog te vaak gekoppeld aan de daadwerkelijke goederenstroom: je spreekt de klant bijv bij overdracht van goederen. Dat kan niet meer bij gedeelde assets, maar vraag is ook of dat oude systeem wel efficiënt is. Door klantrelaties los te koppelen van de goederenstroom (en die mogelijk zelfs deels door anderen te laten doen) kun je meer tijd besteden aan relatiemanagement: niet maar 5 minuten omdat je door moet met pakketten afleveren, maar langer aandacht besteden aan de klant. Of: door je producten via een platform te verkopen, zien veel meer potentiële klanten het dan je in je dagelijkse ritje tegen zult komen.
-4	23	Een open platform waar logistieke vraag en aanbod elkaar vinden zal veel logistieke dienstverleners uitsluiten van de markt.	In mijn ogen is een platform juist een middel waardoor veel meer partijen kansen moeten krijgen (zo zou het althans moeten worden vormgegeven). Maar dat neemt niet weg dat wel elke dienstverlener zelf kansen moet creëren (innoveren) en grijpen. Dus al word je niet letterlijk uitgesloten, als je niet aanhaakt, haak je misschien wel af. De vraag is echter: zouden deze partijen zonder platform wel hebben overleefd.
4	3	Het delen van assets heeft potentieel een positievere impact op leefbaarheid in de stad dan veranderen naar zero emissie voertuigen.	Leefbaarheid in de stad bestaat uit zoveel meer dan uitstoot. Als de overgang naar zero emissie betekent: een dieselvrachtauto die wordt vervangen door een elektrische vrachtauto, maar verder blijft alles hetzelfde, dan heb je weliswaar geen uitstoot en minder geluid, maar nog steeds mogelijk meer vrachtverkeer dan nodig is of het gebied aan kan. In een slecht geval (groter eigen gewicht van elektrische voertuigen, minder laadvermogen over) heb je zelfs méér voertuigen.
4	34	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	In ieder geval voor het verkrijgen van een privilege zoals een ontheffing, maar liefst breder. Deels om als gemeente zo behalve op schoon vervoer ook te sturen op efficiënt vervoer (bijv minimale belading voor een ontheffing). En zo meer informatie te krijgen over het goederenvervoer in de stad. Maar ook vanuit de overtuiging dat een vervoerder/verlader er uiteindelijk zelf baat bij kan hebben, als hij/zij tenminste wil. Datadelen moet dan wel automatisch toegang geven tot platforms, etc die een bedrijf kunnen helpen efficiënter te worden. Als het bedrijf de kansen dan nog niet pakt...

Cornelissen Transport BV

Table C.37: Extreme ranked statements with textual explanation (Dutch), Cornelissen Transport BV

Rank	Nr.	Statement	Explanation
-4	12	Het gevaar op delen van concurrentiegevoelige informatie zou een barrière zijn voor het delen van data maar in de praktijk valt dat mee.	Wat is concurrentie gevoelige informatie, een tarief zou dat kunnen zijn. Vraag blijft hoe compleet (kwalitatief) en betrouwbaar is de informatie en kun je deze met elkaar vergelijken.
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Voorwaarden is vertrouwen, daarvoor moeten de logistieke marktpartijen hun regie, eigenaarschap en identiteit loslaten. Volume en gewicht bepaald inzet, routing en kosten, niet de regulering.
4	27	Verschillende data formats op laadeenheden vormen een grote barrière voor het delen van assets.	Effectieve en efficiency in belading, tijd en kilometers worden hierin bepaald
4	1	Het delen van assets in stadslogistiek is erg gecompliceerd door klant specifieke diensten die worden geleverd.	Effectieve en efficiency in belading, tijd en kilometers worden hierin bepaald

Peter Appel Transport

Table C.38: Extreme ranked statements with textual explanation (Dutch), Peter Appel Transport

Rank	Nr.	Statement	Explanation
-4	8	De meeste logistieke dienstverleners zijn digitaal niet ver genoeg om data te delen terwijl ze dat eigenlijk wel zouden moet zijn.	Inmiddels zijn de meeste LDV'ers aangesloten op slimme systemen die data vergaren en ook vastleggen. de kunst van het delen is meer in het begrijpen van die data en de betrouwbaarheid ervan verhogen.
-4	23	Een open platform waar logistieke vraag en aanbod elkaar vinden zal veel logistieke dienstverleners uitsluiten van de markt.	Ik denk juist dat wanneer het platform er zou zijn kleine partijen makkelijker toegang krijgen tot opdrachten van de grote verladers. Die verladers liggen nu vaak buiten hun bereik omdat ze dan een pakket van diensten moeten leveren die de kleine LDV'er niet kan leveren.
4	12	Het gevaar op delen van concurrentiegevoelige informatie zou een barrière zijn voor het delen van data maar in de praktijk valt dat mee.	Juist in de logistieke dienstverlening zie je partijen veel samenwerken om efficiënter te werken. Samenwerken is de enige manier om beter te kunnen presteren dan de concurrent. Het hebben en benutten van je strategische partners is daarin van groot belang.
4	32	Het uitstellen van bepaalde emissie restricties van 2025 naar 2030 is nodig om stadslogistiek betaalbaar te houden.	Nu al zie je dat de logistiek naar de binnensteden ontzettend duur wordt. De steden lopen leeg als het gaat om winkels en in plaats daarvan komen er steeds meer 'online-'busjes in de stad en rijzen winkelcentra aan de rand van de stand als paddestoelen uit de grond. De restricties werken daardoor eigenlijk averechts.

Provincie Brabant

Table C.39: Extreme ranked statements with textual explanation (Dutch), Provincie Brabant

Rank	Nr.	Statement	Explanation
-4	21	Gemeenten zeggen graag iets te willen doen aan het verduurzamen van stadslogistiek maar meestal alleen omdat het goed staat.	Binnensteden lopen letterlijk vast door verstedelijking. Het aanpakken van duurzame stadslogistiek zorgt voor opbrengsten op het gebied van leefbaarheid (bv. bewoners die de wijk in en uit kunnen en verkeersveiligheid), duurzaamheid (bv. klimaatdoelstellingen) en bereikbaarheid (bv. winkels daadwerkelijk leveren in het afgesproken tijdsvenster).
-4	13	Stadslogistiek is al redelijk efficiënt en vormt niet een zeer urgent probleem, anders zou er al wel meer regulering zijn.	Regulering is een grotere uitdaging voor gemeenten dan je zou denken, omdat het onderwerp een integrale aanpak bij gemeenten vereist en de juridische middelen om het voor elkaar te krijgen bij een gemeente beperkter zijn dan je zou denken. Daarnaast is het ook een kwestie van de noodzaak voelen bij verlader en ontvanger: is men bereid dezelfde prijs te betalen met een wellicht andere leverafspraak dan men gewend is? Stadslogistiek is per type logistiek (winkellevering, bouw, facilitair, afval) op sommige punten misschien efficiënt, maar veelal is er geen gemeenschappelijke aanpak of blik en dus is het gefragmenteerd
4	34	Naast het verplichten van emissievrij transport zouden de gemeenten ook data delen moet verplichten.	Om inzicht te krijgen in welke vervoersstromen er zijn en op welke wijze deze verschillende stromen er zijn, is het nodig dat er data gedeeld wordt. Echter, dit moet ook twee kanten op, dus ook vanuit de overheid naar de markt: wegwerkzaamheden, incidenten, evenmenten, afsluiting, etc.
4	20	De pilots die worden gedaan in stadslogistiek zijn meestal met kleine volumes en hebben daardoor een kleine kans van slagen.	Hier speelt ook een ander aspect een rol: de rol van de overheid. De draaien voornamelijk gestoeld op subsidie of hebben publieke organisaties als grootste of enige klant. De business case is echter vaak niet goed genoeg om opschaling te realiseren.

D | Q-SURVEY

The q-survey was spread via the internet, due to Covid-19 it was not possible to visit all the participants. The website from VQMethod™ provided a tool for the participants to fill the q-sort and answer questions about their most extreme rated statements. In this tool it was also possible to add in a video for extra clarification. The video can be found behind the following weblink.

https://vqmethod.com/stepo/surveyname/HEjVGvU3yN

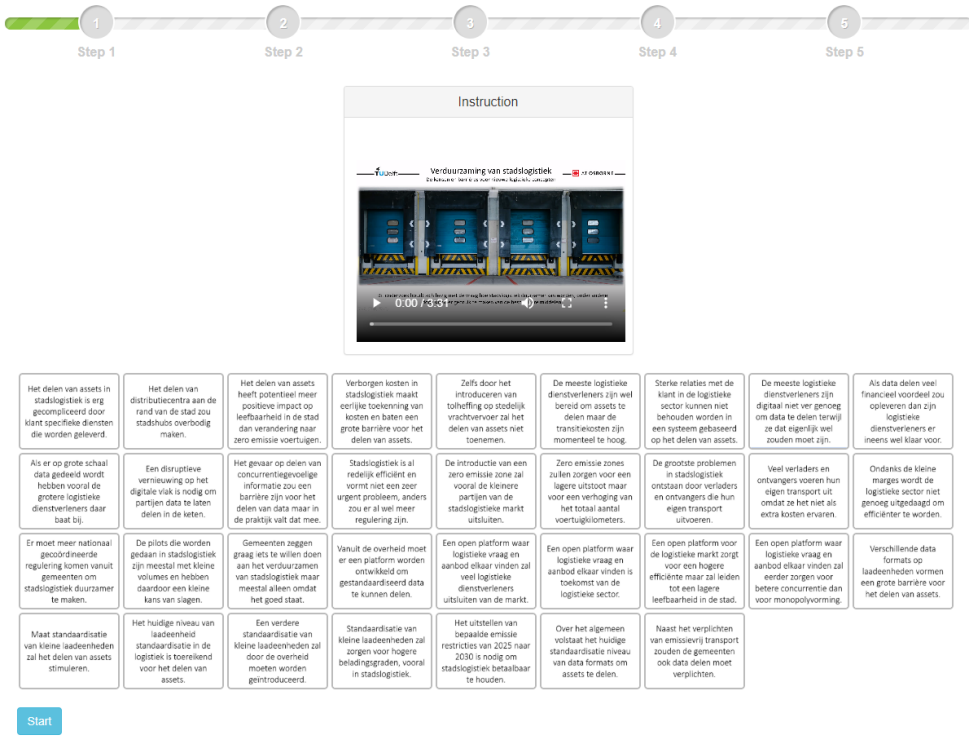

Figure D.1: Screenshot of step 1 in the q-survey, all the statements accompanied with an explanatory video.

E | SCIENTIFIC PAPER