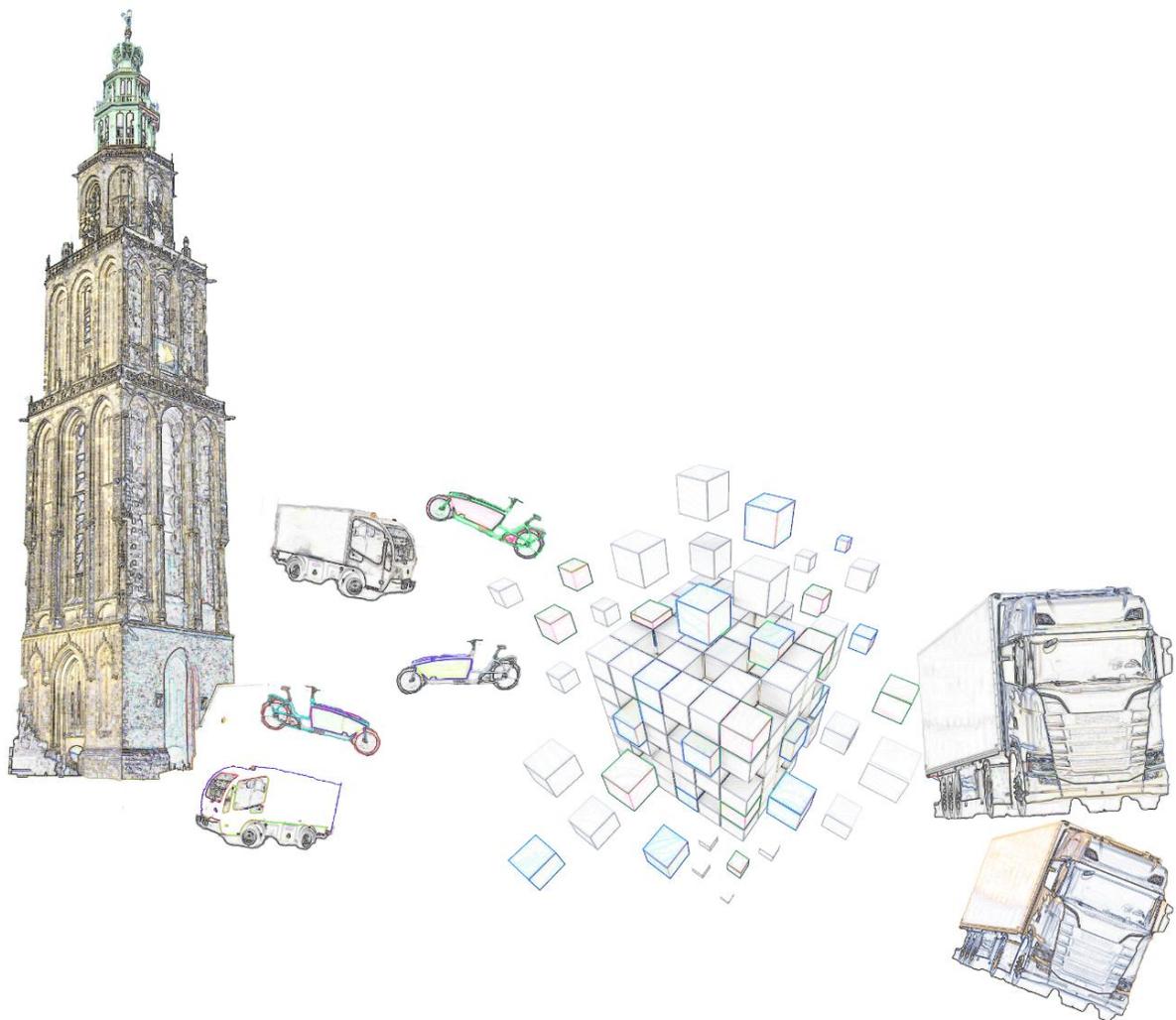


Emission free urban freight transport by means of urban consolidation centers

Under what conditions will urban consolidation centers be successful?



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Preface

Dear Reader,

Hereby, I present you my master thesis on emission free urban freight transport by means of urban consolidation centers. This master thesis is a compulsory part of the master course Environmental and Infrastructure Planning.

In eight months I learned a lot about urban freight transport and sustainable transport in general. Moreover, I immersed myself in the world of urban consolidation centers. Despite the topic of this study is not new – my retiring supervisor Rik Timmer graduated on the same topic – the role of urban consolidation centers is perceived urgent. This urgency enabled me to talk with many inspiring people. Furthermore, I learned how to perform a QCA and use it in research.

I would like to express my gratitude to colleagues of Sweco within the disciplines Planning & Mobility and Spatial Planning & Design, who were willing to share their expertise and knowledge. In particular, I want to thank my supervisor Rik Timmer for his contributions to my thought process. Also, my internship at Sweco enabled to take part in projects and learned me about the life of planning specialists and consultants.

Furthermore, I am very grateful for the supervising role of Femke Niekerk. She helped me setting a theoretical framework and sharpening my research. Last but definitely not least, I want to spend warm words to the interviewees and spoken experts. They gave me interesting insights and I would not have been able to conduct this research without them.

Joren Tijmensen

November 30, 2018

Abstract

Freight transport puts pressure on the livability in urban areas and contributes to the worldwide temperature rise. The municipality of Groningen takes part in European and national scale partnerships in order to counteract urban freight transport emission and to enhance the livability. Still, much is unclear in how urban consolidation centers (UCCs) can have a more substantial role in enhancing sustainable urban freight transport.

The purpose of this study is to inform the municipality of Groningen, and dozens of other municipalities, how to upscale UCCs from the niche to the regime level to enable emission free urban freight transport from 2025 on. This is possible by answering the following research question:

Under what conditions can urban consolidation centers enable emission free urban freight transport in the city of Groningen from 2025 on?

Transition theory framed this research with the help of literature on urban freight transport. This enabled to examine emission free urban freight transport on a landscape, regime and niche level. Further, logically combinations of causal conditions that seem to produce successful UCCs are determined by a qualitative comparative analysis (QCA) of twenty cases. At last, stakeholders of UCCs are interviewed to determine their needs, roles and resources.

This study shows the importance of administrative capacities for UCC upscaling, for example in the shape of exemptions for time windows. The QCA showed the importance of private ownership. Actor interaction is relevant as well and is already largely present in Groningen. Regime level organizations such as governments and the vehicle industry enable upscaling of UCCs from the niche to the regime level. These organizations are key to pull UCC practices into the acceleration phase. Not necessarily by providing funds, but by harmonizing regulation through cities that are streamlined with both municipalities and the vehicle industry.

Keywords:

Urban consolidation center (UCC)– urban freight transport – livability – zero emission – transition theory – QCA – stakeholder perspective

Samenvatting (Abstract in Dutch)

Vrachtttransport oefent druk uit op de leefbaarheid in steden en draagt bij aan de wereldwijde temperatuurstijging. De gemeente Groningen maakt deel uit van Europese en nationale samenwerkingsverbanden om emissie van stedelijk vrachtttransport te verminderen en de leefbaarheid te vergroten. Dit, door gebruik te maken van stedelijke distributiecentra. Desondanks is veel onduidelijk over hoe stedelijke distributiecentra een substantieëlere rol kunnen hebben in de verduurzaming van stedelijk vrachtttransport.

Het doel van dit onderzoek is de gemeente Groningen en verscheidene andere gemeenten te informeren over hoe stedelijke distributiecentra opgeschaald kunnen worden van de niche- naar het regimeniveau, om emissievrij binnenstedelijk vrachtttransport te realiseren. Dit is gedaan door de volgende onderzoeksvraag te beantwoorden:

Onder welke condities kunnen stedelijke distributiecentra emissie vrij stedelijk vrachtvervoer mogelijk maken in de stad Groningen per 2025?

Dit onderzoek is gekaderd door middel van transitietheorie, bijgestaan door literatuur over stedelijk vrachtttransport. Hierdoor kon emissievrij stedelijk vracht transport op een niche, regime en macro level vastgesteld worden. Daarnaast zijn logische combinaties van causale condities die succesvolle stedelijke distributiecentra produceren bepaald met behulp van een kwalitatief vergelijkende analyse (QCA) van twintig cases. Ten slotte zijn behoeften, rollen en middelen van belanghebbenden van stedelijke distributiecentra achterhaald door middel van interviews.

Dit onderzoek bevestigt het belang van administratieve capaciteiten voor het opschalen van stedelijke distributiecentra. De QCA heeft de relevantie van privaat eigenaarschap van stedelijke distributiecentra aangetoond. Interactie tussen actoren is eveneens relevant, daarvan is in Groningen ruimschoots sprake. Organisaties die opereren op het regimeniveau, zoals overheden en de auto-industrie, maken het opschalen van stedelijke distributiecentra naar het regimeniveau mogelijk. Dergelijke organisaties hebben een essentiële rol om de toepassing van stedelijke distributiecentra naar de acceleratiefase te brengen. Dit kan niet zozeer door subsidies te verlenen, maar wel door wet- en regelgeving te harmoniseren, in afstemming met gemeenten en de auto-industrie.

Trefwoorden:

Stedelijke distributiecentra (goederenhubs) – binnenstedelijk vrachtttransport – leefbaarheid – emissievrij – transitie theorie – QCA – belanghebbenden

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1. The urgency of urban freight transport transformation

In this introduction, first climate change is paid attention to, thereafter, this topic is narrowed down via the European and national scale to a local level. Arrived at the local level, the potential of urban consolidation centers as a niche in urban freight transport is discussed. Before the research objectives and the research question are formulated, attention is paid to the scope of this research. This chapter completes with respectively expected results of this research for academia, its expected contribution to planning practice, its societal relevance and the reading guide of this thesis.

1.1 Urban freight transport in spatial scales

Nowadays, the pressure humans put on the climate system by increasing the concentration of greenhouse gas has multiple urgent effects (IPPC, 2013). The climate change as consequence can, due to its characteristics such as lacking an obvious solution and challenging social values, be labeled as a wicked problem as defined by Rittel and Weber (1973). This wicked problem is cross-sectoral and globally urgent because it cuts through international boundaries (Jordan et al., 2010, Zuidema, 2016 & Lemos and Agrawal, 2006). According to the Intergovernmental Panel on Climate Change (2013), scientific evidence for warming of the climate system is evident. Climate change includes the phenomena of global warming. The greenhouse gas carbon dioxide (CO₂), which is among others released by burning fossil fuels, is an important contributor to the warming (NASA, 2018). The characteristics of climate change and the corresponding effects are both relevant in terms of sustainability (there and later) and livability (here and now). Climate change happens on a macro, or 'landscape' level, but affect the meso and micro level as well.

Current political debates acknowledge the human footprint and recognize the urgency of acting to mitigate and adapt to global warming (Biesbroek et al., 2009). This is enforced by the ratification of 176 parties worldwide (UNFCCC, 2018) to commit to the Paris Agreement, which entails limiting global warming up to 2°C above pre-industry levels (UN, 2016). In 2015 already, Europe set the target of reducing greenhouse gas emissions by at least 40% by 2030 relative to 1990 levels (EC, 2018). Thus, the necessity to act is felt on a supranational level and is translated into policy goals with corresponding action plans. These European practices and organizations fit in the meso or 'regime' level.

European policy is translated in the Dutch policy. The national government of the Netherlands deals with the impact of global warming in various ways (Rijksoverheid, 2018). The national government argues that traffic and freight transport is responsible for approximately 20% of the greenhouse gas emission in the Netherlands (Rijksoverheid, 2018). Overruling the European target of 40% greenhouse gas reduction by 2030, the Dutch national government intends to decrease the nationwide greenhouse gas emission by 49% (Rijksoverheid, 2017). For the transport sector, this means a reduction by among others 'measures in cities' and 'electrical vehicles'. The transport sector is responsible for detrimental gasses and particles, such as CO₂, fine particles (PM₁₀) and nitrogen dioxide (NO₂) (Omidvarborna et al., 2015). Based on transport in general, a combined strategy of changing travel patterns, the selection of mode and optimizing the fullness of vehicles with electrification and curtailing fossil fuel vehicles may be necessary to meet the set targets (Brand et al., 2018). Nationally operating interest representation organizations are pushing towards stimulation of innovations, regulation and incentives (Evofenedex and TLN in Bci, n.d.). Here, one can recognize a transition in the transport sector towards emission free

transport. Like the European scale, the national level organizations and rules can be assigned to the meso or 'regime' level.

Conform the phrase 'think global, act local', as described by Devine-Wright (2013), the municipality of Groningen perceives the pressure to act on the global problem of climate change these days. Emissions affect the quality of the air and thereby have an impact on the livability. The RIVM (National Institute for Health and Environment) and the municipality of Groningen measured the quality of the air in Groningen. The concentrations of PM10 and NO2 in the inner city do not meet the guidelines for ambient air quality, set by the World Health Organization (2018) (RIVM, 2018 and Municipality of Groningen, 2017a). Reducing emissions is combined with enhancing the livability in the inner city of Groningen; the pressure of delivery vans on the livability is felt and the amount of delivery vans in the inner city is assumed to grow further (Municipality of Groningen, 2017b). Figure 1 illustrates the pressure of urban freight transport on the livability in the city of Groningen. Therefore, even if emissions will be detached from burning fossil fuels or if electrical trucks will become mainstream – which will be made available in the near future by respectively 'carbon capture and storage' and by companies such as Volvo and Tesla –, alternatives for urban freight transport stay desirable (Meadowcroft, 2009 & De Boer and Zuidema, 2015). Here, emission free urban freight transport should contribute to the livability in two manners. These more dynamic local level where innovation takes place refers to the micro or 'niche' level.

The municipality of Groningen seeks possibilities to facilitate emission free urban freight transport (Municipality of Groningen, 2017b). To cope with the negative side effects of the increasing urban freight transport on the livability and the accessibility, Green Deal ZES (2018) focusses on a new approach for city logistics.



Figure 1: Urban freight transport puts pressure on the livability in the city of Groningen (DvhN, 2018)

This research elaborates on the urgency set by the multiple governmental layers and the trade organization Transport and Logistics Holland, who advocates that CO2 emission of professional goods transport in inner cities should equal 0% in 2025 (FD, 2017).

1.2 The potential of urban consolidation centers

An urban consolidation center (UCC) is a transshipment center near or in a city where goods are consolidated and forwarded to the receivers of the goods. A UCC can reduce goods transport traffic and its associated environmental impacts (Allen et al. 2015). This is possible due to a more efficient last-mile distribution by bundling of freight while enabling cleaner and smaller vehicles in inner cities (Heeswijk et al., 2017). There are different examples of both private and public initiated and led UCCs (eg. the private initiatives London Heathrow and Meadowhall and public initiatives in Gothenburg and Monaco (Bestfact, 2014 and Allen et al., 2015). Some centers are successful in achieving their goals (emission poor transport is mostly one) while others are not. In this study, successfulness of a UCC is dependent on the continuity, contribution to emission reduction and contribution to the livability. In general, a UCC can be schematically visualized as in Figure 2.

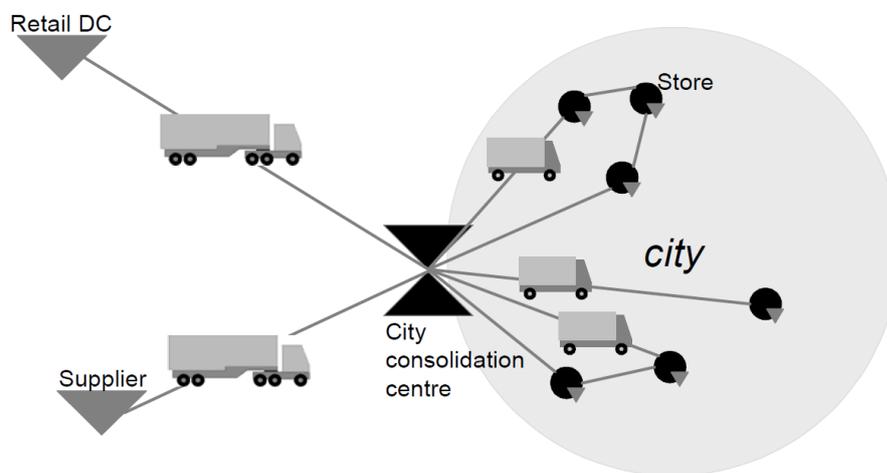


Figure 2: The concept of urban (city) consolidation (Quak, 2008)

There are several case studies which describe UCCs that do or do not achieve the goals. For the city in Groningen, and probably more of the Dutch municipalities in the Netherlands that strive for emission free inner cities, it is unclear how a UCC should be arranged and what the impact on their city is (Green Deal Zes, 2018). The municipality of Groningen desires a UCC (a ‘logistics hub’ in their terms) and strives for innovative bundling of goods (Municipality of Groningen, 2016). In Groningen, there are questions such as: “*how to arrange a logistics hub system?*”, “*which stakeholders are the problem owners?*”, “*how can coalitions be formed?*” and “*what kind of system is suitable to make transport and logistics more efficient?*” (Urban Gro Lab, 2017, own translation). As Allen et al. (2015, p. 109) argue, “[Case studies] can provide important insights into the types of logistics services and service levels required to ensure that UCCs play an important and beneficial role in supply chains”. On the one hand, studies show the benefits of UCCs. For example, Binnenstadsservice’s UCC in Nijmegen proved that the number of trucks and kilometers in the Dutch city center can decrease (Van Rooijen & Quak, 2010). On the other hand, the successfulness seems to be very case specific. Browne et al. (2005) for example, showed that many of the seventeen UCCs they studied have stopped because of unsatisfactory results. However, Browne et al. (2015) argue that vehicle utilization and integrating the operation of consolidation into the supply chain offers potential for UCCs. In short, a UCC in Groningen has the potential to enable emission free urban freight transport, despite it has its complications.

In this study, the focus is on UCCs serving an urban area because this corresponds well with the characteristics of the inner city of Groningen. Namely, the operating areas of UCCs that serve urban areas often have to deal with vehicle congestion, have a preference for walking, handle restricted access

times for trucks and have a low tolerance for air pollution (Allen et al., 2012). In Figure 3, the area with a preference for walking, time windows and a low tolerance of vehicle emissions is marked in yellow.

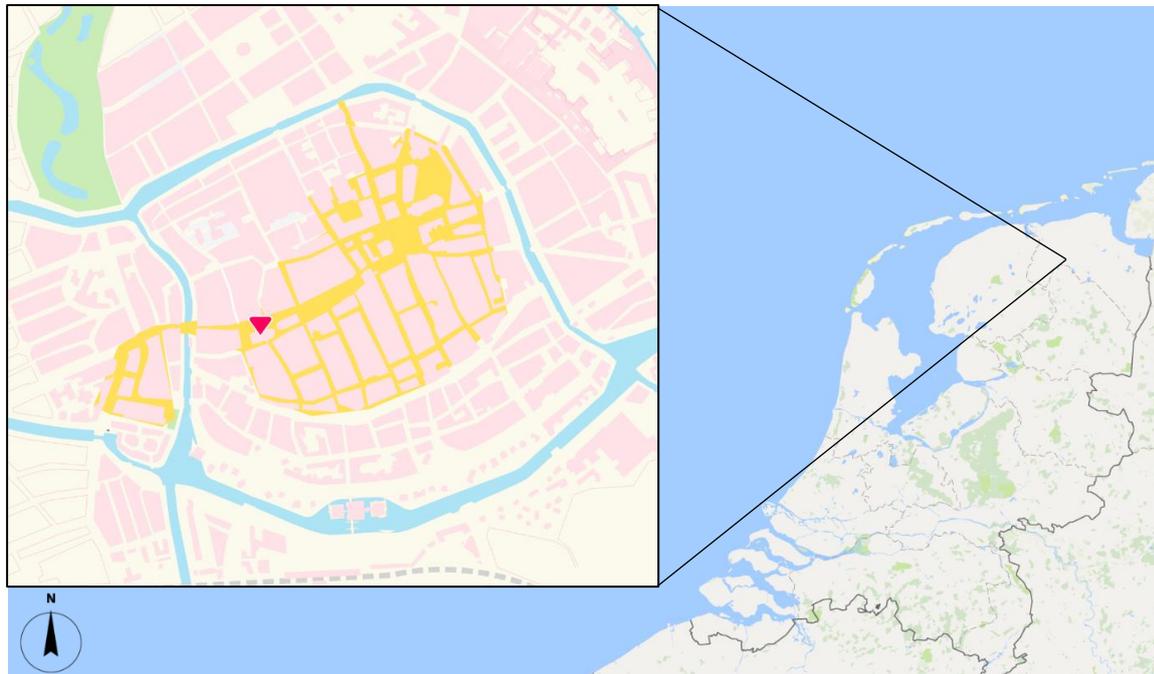


Figure 3: The pedestrian preference zone in the inner city of Groningen (yellow) and its geographical location (Binnenstad 050, 2018 and Mapstyle, 2018)

Considering the sustainability aspect of the problem and since emissions are dispersal and ignore administrative boundaries, a focus on the municipality of Groningen solely would be too simplistic. The director of trade organization Evofenedex emphasizes that a broader view is especially true for city logistics (Evofenedex in Bci, n.d.). As Franzen (2011, p11) states “*The nature of present-day city dynamics requires far more flexibility [than regional or municipal governmental organisations with administrative boundaries] in terms of possible forms of cooperation. An approach is needed wherein cities, reasoning from their own defined areas of interest (and/or integrated development vision), enter into ever changing alliances with other public organisations to reach certain objectives.*” For this reason, besides the potential emission free area set by the municipality of Groningen as a focus area, both governmental and non-governmental national scale actors that probably have an interest in a UCC in Groningen are taken into account in this research. Moreover, a multi-level perspective is used to give meaning to a broader view.

Interaction between logistic chains is not new, however, examples of effective and sustainable urban freight transport are scarce (4C4More, 2015 and Quak, 2008). Transition theory, see chapter 2, shows that the interaction between actors is key to elevate innovations that arise on the niche level, such as UCCs. To sum up, this research focuses on UCCs that serve inner cities and parties that have a stake in urban freight transport in the city of Groningen.

1.3 Research objectives

The aim of this study is to provide insight into under what conditions UCCs can contribute to emission free urban freight transport. This helps to enable the city of Groningen contributing to emission free urban freight transport. This study sheds light on what logically possible combinations of causal

conditions of a sustainable UCC are and how these relate to the needs, roles and resources of stakeholders in the city of Groningen. Stakeholders are among others haulers, carriers and the municipality. This objective will be reached by giving the municipality of Groningen a substantiated suggestion of how to fulfill conditions to enable urban consolidation center upscaling. Based on that UCCs are both successful and fail, it is reasonably possible that its successfulness can be assigned to a combination of conditions. Another expected outcome of this study is an acknowledgment of the attitude of different stakeholders towards usage of UCCs, whom may be skeptical. The current main perception is that a UCC is costly because it causes an extra transfer (Quak, 2008). However, now just in time delivery gains importance and regulations will prohibit the current urban freight transport affairs, making use of UCC can turn out to be a promising alternative.

1.4 Research question

In order to reach the research objectives, the following research question is formulated:

Under what conditions can urban consolidation centers enable emission free urban freight transport in the city of Groningen from 2025 on?

This research question leads to the following sub-research questions:

1. *How can UCCs structurally have a role in emission free urban freight transport following insights of transition theory?*
2. *What are emission free urban freight transport practices in Groningen on the landscape, regime, and niche level?*
3. *Which combinations of administrative capacities, actor interaction, degree of public ownership and regime powers produce successful UCCs?*
4. *What are the needs, roles and resources of main stakeholders in using a UCC in Groningen?*

1.5 Academic relevance

For academia in general, the outcome of this research provides an overview of what conditions contribute to UCCs that enable livable and emission free urban freight transport. Moreover, knowledge about successful UCCs is provided with respect to insights from transition theory, referential cases, and stakeholders' needs, roles and resources. Attention is paid to multi-actor interaction and influence of niche and regime level actors of UCCs, such as the local government, haulers and carriers. Based on the situation of Groningen and twenty UCCs, this study informs stakeholders how to play parts in emission free urban freight transport by means of a UCC. To give meaning to the research suggestions of Rozema (2016) for a transition towards sustainable city logistics, perceptions on future urban freight transport of both a transport association and a retailers association are considered. This research enriches the academical debate by giving meaning to the needs, roles and resources of all stakeholder groups of UCCs. Moreover, following Quak (2008) his research suggestion, logistics service providers as a stakeholder of urban consolidation centers are included in this research and actors are consulted concerning local policies. The inclusion of these stakeholders fills a knowledge gap and informs more completely about their needs towards upscaling UCCs.

Although the study is specific to the current context of the city of Groningen, results of the referential case analysis, which indicate what combinations of conditions are generic, can be valuable for other Dutch cities. Since the objective of emission free urban freight transport is set by multiple Dutch municipalities, there is more potential next to Groningen. This is not the first study about consolidation

centers. Compared to existent studies, new is that both evaluations of the successfulness of UCCs and local stakeholders are considered while being structured by transition theory.

1.6 Expected results for planning practice

For planning practice in particular, this study will offer insight into under which conditions UCCs can contribute to emission reduction in the inner city of Groningen. It adds to the current debate on the potential of a UCC in Groningen on achieving emission free urban freight transport. More specific: the municipality wants to investigate the possibility of working with multiple hubs (Urban Gro Lab, 2017). Related questions mentioned are ‘*which stakeholders are problem owners?*’, ‘*how can coalitions be formed?*’ and ‘*what are appropriate locations for such hubs?*’ (Urban Gro Lab, 2017). Transition theory shows that the process of making use of UCCs in urban freight transport common sense, i.e. upscaling the innovation, requires multiple actors and can be divided into multiple phases and levels. This study shows in what manner a UCC in Groningen can foster the transition towards emission free urban freight transport, with respect to the literature on transition theory, perspectives of stakeholders and lessons from other UCCs.

Putting this research in a broader perspective, the outcome can contribute to the health of people. An effect of emission reduction is that it results in fresher air and a UCC offers the opportunity for transport by active transport (bicycle). Also, since a UCC can result in fewer vans and fewer trips, which in turn can result in less congestion, shorter travel times, cleaner air and increasing safety in the city center, it can result in more livability.

1.7 Reading guide

The structure of this thesis is as follows. In the next chapter the research is theoretically framed by laying relations between various concepts and by describing the results of the first sub-research question. Chapter 3 elaborates on the methods and techniques used this research. The subsequent chapter formulates the results of the second, third and fourth sub-research question. The main research question and the sub-research questions are answered in chapter 5. This concluding chapter further puts the research outcome in a wider perspective. Before the used literature and the appendices are shown, chapter 6 pays attention to a reflection on the research process and outcome.

2. Theoretical framework

This chapter provides a theoretical frame of the research by describing theoretical insights. The theories, of which transition theory is the structuring theory, are formulated to understand relevant phenomena such as emission free urban freight transport and transitions. This, to get an understanding of '*how UCCs structurally can have a role in emission free urban freight transport following insights of transition theory*'. There is a broad range of perceptions of those phenomena. In this chapter, these terms are substantially delineated. Key concepts are the multi-level perspective, actor interaction and innovation upscaling from the niche to the regime level. These concepts are described and brought together. Relevant authors for the foundation of the theoretical framework for this research are among others Rotmans (2001), Loorbach (2010), Meadowcroft (2009), Geels (2012) and Quak (2008).

2.1 Transition theory: multiple phases, levels, and actors

Urban freight transport and transport is lagging behind when it comes to greenhouse gas reduction (FD, 2018). According to Geels (2012), the transport system consists of elements as infrastructure, knowledge, technology, and policy. Short-term policy, as part of the transport system, is framed by long-term thinking and is to achieve concrete goals (Loorbach, 2010). In order to achieve set policy goals, the current transport system has to change to a system which is not producing greenhouse gasses. A process of structural system change can be called a transition and has a duration of at least 25 years (Meadowcroft, 2009 and Rotmans et al., 2001).

2.1.1 Multi-phase

Conceptually, a transition can be unraveled in four phases; the predevelopment, the take-off, the acceleration, and the stabilization phase (Rotmans et al., 2001). The phases are visualized in Figure 4. Each phase corresponds with roles for actors (Rotmans et al., 2001 and Loorbach, 2010). Rotmans et al. defined that the beginning stage of a transition is the pre-development stage, followed by the take-off phase. One can argue that the innovation of UCCs is currently in the take-off phase, since experiments with UCCs are getting a permanent status, but are failing as well the last decades. More specifically, one leg can be considered in the acceleration phases already. Namely, seem regimes to be open to a transition. This place is indicated with a dot in Figure 4. Theory-wise, the largest size of the change in the shortest time period takes place in the subsequent phase: the acceleration phase (Rotmans et al., 2001). In this phase guidance of the direction of development is hardly possible since reactions reinforce each other rapidly. This phase flows over in the stabilization phase, which indicates that a transition comes to its end and the change becomes structural.

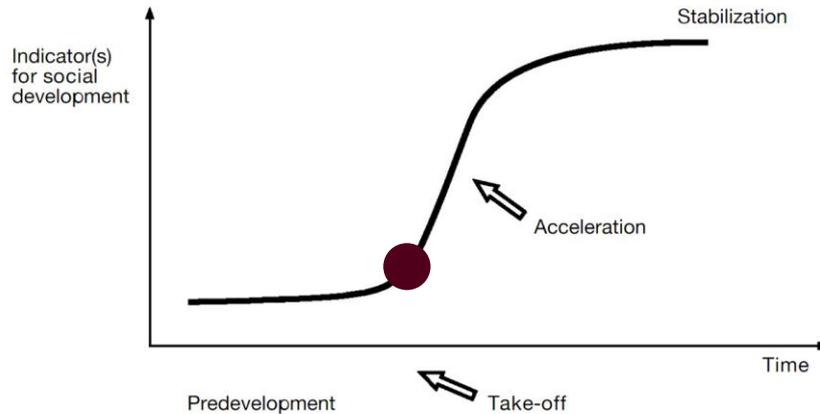


Figure 4: The four phases of transition (Rotmans et al., 2001)

2.1.2 Multi-level

Besides these multiple phases, transitions are characterized by multiple levels. One can recognize a distinction between a macro, meso and micro level (e.g. Loorbach, 2010, Rotmans, 2001, De Boer & Zuidema, 2015). This division articulates well with respectively the ‘landscape’, ‘regime’ and ‘niche’ level, as defined by Rip and Kemp (1998) and Meadowcroft (2009). The landscape level comprises a conglomeration of organizations and institutions and values, worldviews, material infrastructure and politics (Meadowcroft, 2009, Rotmans et al. 2001, Van der Brugge, 2005 and Kemp 2010). Subsequently, the regime level entails dominant practices, networks, organizations and rules (Rotmans et al., 2001, Van der Brugge, 2005 and Kemp & Loorbach, 2006). In contrast to the landscape and regime level, the niche level is dynamic. It comprises local practices, individual actors and technologies (Rotmans, 2001 and Rip & Kemp, 1998). At this niche level innovations can occur (Geels, 2014, Meadowcroft, 2009, Rotmans et al. 2001 and Kemp 2010). Rotmans et al., (2001) describe that in the early stages the regime level normally inhibits these deviations of the status quo. So, regime level organizations exercise power, which according to Pfeffer & Salancik (1974: 3) is “*the ability of those who possess power to bring about the outcomes they desire*”. This strives well with the early Weberian idea of power which is that “*one actor ... [can] carry out his own will despite resistance*” (Weber, 1968, p. 53). Mitchell et al. (1997) argue, based on Etzioni’s work, that power is transitory since the access to means (in terms of physical, material and financial or symbolic recourses) is variable. This perspective is more recently reinforced by the argument that the regime later can have an enabling role by upscaling the niche level innovations to the organizational power of the regime level, and slowly to the belief systems of the landscape level (Meadowcroft, 2009 and Rotmans et al. 2001). Next to these bottom-up transformations, a top-down interaction where the landscape level values affect the regime level institutions that stimulates niche level innovations is possible (Geels 2014, Meadowcroft, 2009 and Rotmans et al. 2001). Structural change can also start at the regime level, as long as there is interaction with the other two levels. See Figure 5 for a visualization of the interaction between the landscape (macro), regime (meso) and niche (micro) level. Besides horizontal interaction between the levels, vertical interaction takes place as well (De Boer & Zuidema, 2015 and Loorbach, 2010). So during transitions, there is interaction between multiple niches and between niches and their context. The multi-level perspective can be used to analyze “*the possibilities, barriers and drivers of transitions towards sustainable transport*” (Geels, 2012).

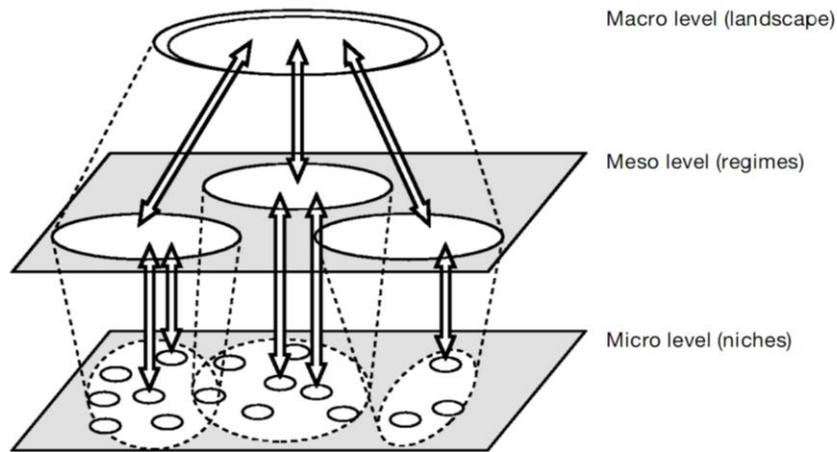


Figure 5: Multi-level perspective (Geels & Kemp, 2000 in Rotmans et al., 2001)

2.1.3 Multi-actor

Described by e.g. Loorbach (2010), Rotmans et al. (2001) and Meadowcroft (2009) is that multiple actors are involved in transitions and in transition management. Rotmans et al. (2001) find that governments can foster transitions in a stepwise manner and should have a leading role in managing a transition. This gets shape by inspiring a learning process and encouraging actors to participate. Empowering stakeholders by involvement commit those actors to the new system (Banister, 2008). Moreover, social learning, or engagement and understanding of the reasoning behind policy initiatives of key actors, is a necessity for supported policies or shared solutions (Banister, 2008, Loorbach, 2010 and Koppenjan & Klijn, 2004). Governments are largely using approaches in which societal stakeholders are involved in policy making (Loorbach, 2010). By means of permitting and stimulating experiments and guiding with legislation, local governments can manage transitions. In transition thinking, two roles for the government can be recognized: the content role and the process role (Rotmans et al., 2001). Loorbach (2010) stresses that these roles of the government in transition management are complementary. Setting objectives such as greenhouse gas emission reduction are part of the content role. The process role entails stimulation and organization of the transition process, activating stakeholders, enabling opportunities for actors and creating boundary conditions for the structural change (Rotmans et al., 2001).

The mentioned transport system elements are maintained, reproduced and changed by actors as firms, policymakers and consumers (Geels, 2012). The elements and the number of different actors in urban freight transport, increase the complexity compared with other sub-systems (Geels, 2014). The actors in urban freight transport are freight carriers, shippers or receivers, administrators and residents and have different roles, objectives, and interests (Taniguchi et al., 2003 and Quak, 2008).

Giving meaning to the multi-actor involvement of transitions, in terms of initiatives towards sustainable urban freight transport, a distinction can be made between the public and private sector. Where internationally seen, governments as public parties are mostly initiating policies, companies are concerned with energy saving and technological innovation (Ambrosini and Routhier, 2004). According to Faludi (2000), planning governments should restrain other actors, both public and private ones. Nowadays, however, local innovation policies gain importance and there is more interaction and collaboration between public and private actors (Grotenberg & Van Buuren, 2018). Referring to transition thinking, Salet and Woltjer (2009) noticed a regime change towards a planning approach in which private and public actors together take spatial intervention initiatives. Heeres et al. (2012) made a distinction between multiple planning approaches and showed that approaches become more area

oriented, which has the consequence that more actors are involved. The Dutch regional planning approach itself stresses the involvement of multiple layers of the government as well as non-governmental organizations (Janssen-Jansen & Woltjer, 2010).

2.2 Urban freight transport in transition

Multiple niches can be recognized that are to contribute to sustainable emission free transport (Geels, 2014). Parties are concerned with niches as urban consolidation, urban pick up initiatives, night deliveries, carbon capture and storage, time restrictions, multimodal transport, intelligent transport systems, communication, energy grids, carrier cooperation and low emission zones (Quak, 2008, Allen et al., 2012 and Várandi et al., 2015, de Boer & Zuidema, 2015). Transition literature is mainly focused on niche innovation and less attention is paid to incumbent actors and existing regimes, whilst the latter is powerful in persisting current practices (Geels, 2014). Geels (2012) argues that regime actors such as policy makers, transport planners, and the vehicle industry are aware of landscape level pressures as climate change. The main perception of regime actors is that technological innovations, described by Banister (2008) as only one of the four complementary approaches towards sustainable transport planning, will suffice for the transport sector (Geels, 2012 and Meadowcroft, 2009). Capacities and resources of parties that are involved in the regime level, are not limited to laws and strict policies but are embedded within its relations and dynamics (González & Healey, 2005 and Lodge & Wegrich, 2014). Current greenhouse gas emission related regulations seem to be based on technological feasibilities, which give transport industries power to influence these regulations and resist structural change (Geels, 2012 and Geels, 2014). Avelino and Rotmans (2009) state that regimes usually have more power than niches since regimes employ more resources. Savini (2015) argues that spatial planning is to organize economic, legal and locational resources across space and time. More specific, Grotenberg and Van Buuren (2018) find that governments should provide administrative capacities in order to spur innovation. This entails enable funds, provide knowledge and information, set up arenas for collaborative interaction and add, change or remove legislation.

2.3 Focus on a niche: urban consolidation centers

Nowadays, making use of UCCs in urban freight transport is not common practice. However, there are examples of cities where actors are pushing the use of UCCs to a standard related to urban freight transport. This perspective on UCC practices articulates well with the definition of a niche set by Rotmans & Loorbach (2009): *“a structure formed by a small group of agents that deviate from the regime and that might build up a new regime that is able to break down and replace the incumbent regime”*.

Experiences in inner cities gained importance last years. Inner city visits are done among others for shopping and are pending on how city centers are experienced by people (Dutch council shopping districts, 2016). The experience in inner cities is relevant since consumers shop likewise products online on a large scale (DTNP, 2015) and e-commerce is continuously growing (Logistiek, 2018a). In the current logistics practices involved in urban areas, trucks are the main providers of goods. A reason for the usage of trucks in the last mile, see e.g. Munuzuri (2005), is that the road network density is high enough to deliver the goods to the retailers (Quak, 2008). Browne et al. (2012) mention, in line with the municipality of Groningen, five negative externalities of this freight traffic: air pollution, noise pollution, greenhouse gas emission, decreased safety and traffic congestion (Municipality of Groningen, 2016). Reisman (2011) adds unsightliness of trucks in the inner city as a negative effect of current city logistics. The total vehicle kilometers affects all the by Browne classified externalities. Greenhouse gas emission depends, next to the total vehicle kilometers, on fossil fuel consumption per vehicle kilometer (Browne et al., 2012). Load consolidation, modal shift and use of vehicles powered by non-fossil fuels,

including bicycles, are the mentioned initiatives that articulate well with UCCs that provide the possibility to make use of non-fossil fuel, and thereby shorter range, vehicles. Diminishing negative externalities will enhance the livability in inner cities and thereby contribute to positive experiences of visitors. Reisman (2011) found that livability, as well as urban freight efficiency, can be improved by means of an integrated multi-modal system based on strategically located distribution centers. With the range of bicycles and electric vehicles in mind, a UCC close to the destination of goods can be considered beneficial. Quak (2008) argues that urban consolidation centers, especially those that enable fossil fuel free vehicles for inner city transport, are good for the environment. This statement can be disputed since electric vehicles, which are fossil fuel free, still have an impact on the environment. In the Netherlands in 2016 for example, 81% of the produced electricity is generated by fossil fuels (CBS Statline, 2018). Further, the increase of energy production led to a growth in greenhouse gas production in the Netherlands in 2017 (CBS, 2017). Despite these emissions are produced at another place than the inner city, air is still being polluted. In this research however, the use of electric vehicles are considered sustainable since no greenhouse gas emission is produced directly and greenhouse gas-free energy production and usage is possible. Renewable energy itself is a category for mechanisms described by Lemos and Agrawal (2006) to mitigate climate change. Without regarding fossil fuels in particular, based on 24 cases, the realization of urban consolidation centers reduces greenhouse gas emissions with 60% to 80% between the UCC and the final destination (Allen et al., 2012). In short, consolidation of goods as a niche can be considered as a chance for enabling emission free urban freight transport.

Quak (2008, p50) defines the practical main objective of UCCs in terms of splitting freight transport into two parts: *“the part inside the city and the part outside the city. One can benefit from the advantages of large vehicles for long-haul transport outside the city without having these large trucks and the related problems in the city”*. UCCs can prevent hindrance of time windows or environmental zones for long-haul transport trucks. This form of urban consolidation relates to the type *“UCCs serving all or part of an urban area”* of the total of three types described by Allen et al. (2012). UCCs, also called hubs, can be defined as *“facilities that work as consolidation, connecting, and switching points for flows between stipulated origins and destinations”* (Farahani et al., 2013). According to Browne, such smaller urban terminals are part of resolving fragmented logistics (Browne in Urban Insight, 2018). A UCC will be the last node before the last transportation and – for the time being – the final destination of goods. A UCC enables a change from the current single-drop roundtrips from often decentralized goods supply towards multi-drop roundtrips with centralized goods supply (Quak, 2008). The change of the physical movement of goods influences the interrelationship between the actors and goods, network, land use, and vehicles (Woudsma, 2001), which brings us to challenges of upscaling UCCs.

According to Quak (2008), implementation of a UCC is hard due to high initial costs for developing the center and because the extra needed transshipment increases logistics costs for the shipper. Moreover, the actor who benefits financially is not always clear (Van Rooijen & Quak, 2010). Van Rooijen & Quak (2010) find further, that the organization of city consolidation is harder than of a distribution center since cooperation between multiple actors is a necessity. Following the archetype of Quak (2008) on consolidation centers, a terminal operator, carriers and local authorities are stakeholders of UCCs.

2.4 Transition theory on urban freight transport in essence

It has become clear that multiple conditions are important for a transition towards sustainable urban freight transport by means of urban consolidations centers. Niche level actors need to interact and through spatial planning, resources can be mobilized within niches (Stone, 1993 & Savini, 2015). Niche level initiatives can be supported by utilizing administrative capacities and close cooperation between private and public parties (Grotenberg & Van Buuren, 2018). When niches gain enough power,

embedded regimes can be influenced by interaction whereby structural change of the urban freight transport system can be achieved. Taking knowledge of the described concepts, being aware of the need for key actor interaction to upscale consolidation centers from the niche to the regime level, and recognizing the impact of capacities and resources, the conceptual model in Figure 6 can be made.

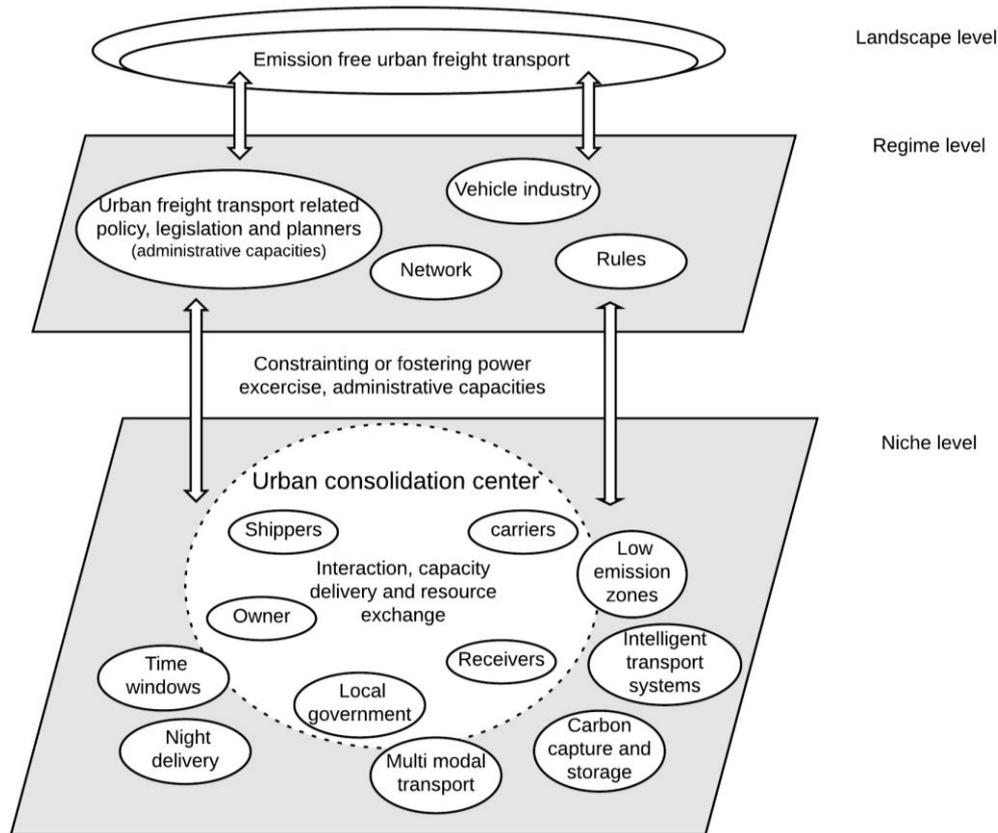


Figure 6: A multi-level framework from the perspective of urban consolidation centers (Author, 2018, based on Geels & Kemp, 2000 in Rotmans et al., 2001)

The visualization in Figure 6 implies that multiple conditions are decisive in the successfulness of UCCs. Namely, actors interact and share resources while being fed by governmental administrative capacities. This, while incumbent regimes are exercising constraining or fostering power on the niche level actors' developments. This interaction between both private and public niche level and regime level actors can result in the arrangement of UCCs, which in turn is beneficial for the livability in city centers and enables emission free urban freight transport. Whether interaction between actors, influenced by regime level actors and administrative capacities such as governmental funding, legislation and knowledge enables UCC upscaling in Groningen, is explained by answering the remaining sub-research questions. The next chapter elaborates on how the sub-research questions are answered and why so.

3. Methodology

The previous chapter provides a theoretical framework for this research and gives structure to the research strategy. In this chapter described is how data is obtained, which method is used and why this method is used. For all the sub-research questions applies that obtaining information is the first step, followed by analysis (consisting of decomposition and synthesizing (Baarda et al., 2013)) and reflection. Whilst this chapter describes how these steps are done, chapters 2 and 4 pay attention to the actual results.

3.1 Research approach & used methods

In order to answer the research question ‘*Under what conditions can urban consolidation centers enable emission free urban freight transport in the city of Groningen from 2025 on?*’, data is collected with multiple research methods and with the help of multiple data sources. Results of the sub-questions are complementary for a research on upscaling UCCs. The reason for the use of multiple data sources and of multiple methods of data collection is that the different sub-questions ask for different strategies. Moreover, triangulation helps in ensuring validity and trustworthiness (Baarda et al., 2013). In Figure 7 the methods that ensure triangulation in this research are visualized.



Figure 7: Visualization of the multiple methods that together answer the research question

The following sections explain why articles and policy documents are studied and how semi-structured interviews help to understand the needs of stakeholders in achieving a successful UCC. The interviews are held with stakeholders of a UCC in Groningen and interviewing is the method for understanding the needs, roles and resources of these stakeholders. Conditions that contribute to durable, emission reducing and livability enhancing UCCs are acknowledged by studying literature related to transition theory and the performance of UCCs. One could argue that ‘action research’ in addition is a suitable research method since there is a problem that needs to be solved (Baarda et al., 2013). However, since the direction of the solution is already known in this research, i.e. usage of UCCs, and because executing

a UCC along with empirical testing is not possible due to time restrictions, this method is not used in this research. To make sense of the conceptual model in the previous chapter (Figure 6), fuzzy set qualitative comparative analysis is used in addition to the literature and interviews. Figure 8 shows the different steps. The numbers in Figure 8 are corresponding with the sub-research questions, and ‘RQ’ marks the main research question.

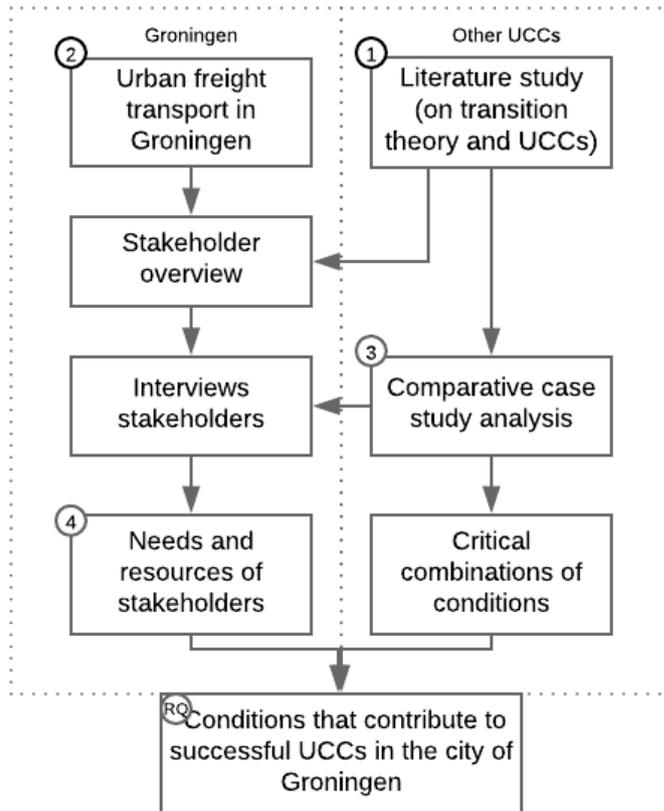


Figure 8: Visualization of the multiple methods that together answer the research question

3.2 Explore urban freight transport in transition

In order to successfully answer the main research question, the sub-research questions are answered first. The first sub-research question, ‘*how can UCCs structurally have a role in emission free urban freight transport following insights of transition theory?*’ is answered by means of literature research. Literature research is performed to dive into the topic of this research, conform Baarda et al. (2013) their perspective of the objective of literature research. Literature is obtained via library catalogs as WorldCat, Springer Link, and Scholar and via books from among others the library of the University of Groningen. The scientific literature is focused on transition theory and on urban consolidation centers. The phenomena are delineated by scholars as Rotmans (2001), Loorbach (2010), Meadowcroft (2009), Geels (2012) and Quak (2008). They write about the multi-level perspective, actor interaction, stakeholders of UCCs and innovation upscaling from the niche to the regime level. Sub-research question 1 is answered in chapter 2.

3.3 Examine urban freight transport in Groningen

The second sub-research question, ‘*What are emission free urban freight transport practices in Groningen on landscape, regime and niche level?*’ is answered by means of existing material and literature study, as explained by Baarda et al. (2013) as desk research. Besides academic literature from the above described platforms, grey literature sources are used here in order to draw the context and current practices. Specific for the niche level, facts and figures concerning emission free urban freight transport from the literature are compared with the actual situation in Groningen and the city’s objectives. This information is retrieved from municipal programs, visions, and plans, completed with a conversation with Sjouke van der Vlugt, policy officer on the field of urban development, on June 21, 2018. The consulted municipal documents are listed in Table 1. Section 4.1 represents the results of this sub-research question.

Table 1: Consulted municipal policy documents

Title	Sort document	Year
Begroting (Budget estimate)	Budget estimate	2018
Bestemming binnenstad (Destination inner city)	Ambition document	2016
Groningen geeft energie (Groningen energizes)	Program	2015
Laden en lossen in de binnenstad (Loading and unloading in the city center)	Website	2018 (c)
Meerjarenprogramma Verkeer en Vervoer 2018–2021 (Multi-annual program traffic and transport 2018–2021)	Multi-annual program	2017

3.4 Discover combinations of conditions of successful UCCs

The third sub-research question is: ‘*which combinations of administrative capacities, actor interaction, degree of public ownership and regime powers produce successful UCCs?*’. The outcome of the first question was input for this question. From the scientific literature, four conditions are identified that set the expectation to determine the transition of urban freight transport by UCCs, namely: 1) interaction between actors, 2) provisioning of administrative capacities by governments, 3) public or private ownership and, 4) exercise of power by regimes.

The understanding of the role of UCCs in urban freight transport is complemented by consultation of Paul Buijs, Assistant Professor Sustainable Logistics at the University of Groningen. During the conversation, which has similarities with Baarda et al. (2013) their explanation of ‘topic interview’, notes are taken. In this study used phrases and perceptions retrieved from the conversation is verified with the consulted expert. The sub-research question itself is answered in section 4.2 by comparing referential case studies. The next section explains the method of comparison. Thereafter, why which cases are taken into account is elaborated upon, followed by an explanation of the conditions and the extraction of the results.

3.4.1 Qualitative case comparison

In order to compare cases and determine to what extent the conditions contribute to durable and emission reducing UCCs, the ‘most similar systems design’ seems to be a suitable method. This method namely can point out meaningful differences between cases (Lafferty, 1972). However, this method focusses on cases which are similar except for one condition, e.g. the interaction between actors (Anckar, 2008).

Since contextual factors are applicable and a short view on case study analyses show that differences are not exceptional, the ‘most different systems design’ is a more suitable method for analyzing the case study analyses and evaluations outcomes. This method takes cases which are different in most conditions but have the same outcome (Ankar, 2008 and Przeworski & Teune, 1970). Affirmed by Lijphart (1975), Przeworski and Teune (1970: 34-35) explain that this method focusses on “*eliminating irrelevant systemic factors*”. A drawback of this method is that inferences are less secure than with quantitative comparison (Landman, 2005).

Giving meaning to this disadvantage, in this study is chosen for qualitative comparative analysis (QCA). The method allows for case-based and comparative research, can be seen as ‘a middle road’ between qualitative and quantitative research, and allows for formalized and systematic case comparison (Ragin, 1987 & 2014). Moreover, in contrast to the most similar/different system design methods, the QCA method allows for unraveling underlying causal mechanisms and further research of combinations of conditions (Pattyn, 2014). The complex causality in QCA is based on implication. A condition is determined necessary or not and sufficient or not. For example, condition ‘Y’ is necessary when the dependent outcome (a successful UCC) cannot be achieved without it (Verweij, 2013 and Ragin 2017). A condition is sufficient if it can produce the outcome (a successful UCC) by itself (Verweij, 2013 and Ragin, 2017).

Literature to understand the theoretical and practical application of QCA is provided by Fadi Hirzalla on mail request on March 29, 2018. Hirzalla uses this literature for his Ph.D. course ‘*Introduction to Qualitative Comparative Analysis (QCA)*’. Further, Stefan Verweij, a researcher in infrastructure planning with a focus on QCA, is consulted on the applicability and execution of QCA in this research particularly. The conversations with Verweij took place on April 13, 2018 and October 17, 2018. Verweij also provided useful literature in October 2018. In this study is chosen for both fuzzy set and crisp set QCA. In crisp set QCA, a case is either in (i.e. membership, 1) or out (i.e. non-membership, 0) a set (Ragin, 2017). This binary-code data is based on Boolean algebra. The fuzzy set is applied in three of the four conditions. Here, besides a 0 (non-membership) and a 1 (membership), a case can more out than in (0.33) and more in than out (0.67). The calibration of the conditions, the justification of assigned memberships, can be found in Appendix I, Table I. The main product of a QCA is the truth table, see section 4.2.1, Table 7. Here, combinations of causal conditions are presented in a row, accompanied by the outcome of the explanatory variable (Verweij et al., 2013 and Ragin, 2017).

According to Schneider and Wagemann (2010), a QCA and its associated outcome (the truth table) should be performed by computer software since it is less subject to human error than human beings are. The QCA method is performed with the software program fs/QCA, version 3.0 (Ragin, Davey & Drass, 2017). The software is retrieved from Compasss.org, which entail a network of scholars and practitioners concerned with multiple causality and systematic comparative case analysis (Compassss, 2012). The input for the analysis was information about cases, see Appendix I, Table II. Which cases are picked and why these cases, is elaborated upon in section 3.4.2.

3.4.2 Case selection

In order to prevent from reinventing the wheel and to learn insights from referential cases, ex post and ex nunc evaluations concerning UCCs serving an urban area are acknowledged by means of desk research. This means that the analysis of existing material is the data collection method (Baarda et al., 2013). Smelser (2013) has listed five criteria for case selection, which concisely described entail that units of analysis are appropriate to the kind of problem; are relevant to the phenomenon being studied; are constant with respect to the classificatory criterion; should reflect the degree of availability of data and selection and classification of the units of analysis should be based on repeatable procedures. Since all analyzed cases that are input for the QCA, intent to organize urban freight transport by means of a UCC serving an urban area, and the consulted sources are made transparent, Smelser’s (2013) demands

of case selection are fulfilled. Thus, cases are picked by the by UCCs served area type and by the availability of evaluations and its content density. The available content covers at least information about administrative capacities, actor interaction, ownership and regime powers. This is the area of homogeneity, which is required to explain generalize by means of QCA (Gerrits & Verweij, 2018). Case evaluations that lack information on actors, administrative capacities or regime influences are completed with grey literature if possible. If grey literature does not complement, the cases are out of the scope to prevent from distortion due amount of data per case. An example of a UCC initiative that lacks information is SAMP in Barcelona. Of the picked cases, a total of twenty cases is part of the analysis. This amount of cases in combination with an the amount of four conditions is conform the reasoning of Gerrits & Verweij (2018).

Politically, countries differ on multiple issues (Rose, 1993 & 2005), vice versa, Dutch studies are politically, and probably also infrastructurally and organizationally seen, more similar. For this reason, the largest group consist of Dutch cases. Still, because outcomes are area specific and context dependent, this analysis contains cases that are not one to one comparable with the city of Groningen (Reimer & Blotevogel, 2012). Ragin (2004) justifies this intentional selection of cases in case-oriented research. To sharpen the scope further, UCC initiatives making use of transport modes alternative to road transport, such as ‘Bierboot’ in Utrecht or ‘Mariteam’ and ‘De City Cargo’ in Amsterdam, are not in the scope of this research. In sense of these restrictions, the analyzed cases are suitable for drawing lessons from.

The analyzed UCCs are established between 1997 and 2017 and evaluations are done from 2005 until 2018. Beside scientific reflections from e.g. Browne et al. (2010), Scott Wilson (2010) and Pedersen (2012), Bestfact’s and Bestufs’ evaluation database and grey sources as newspapers and company websites are consulted. The cases that conform to the described restrictions and therefore are used for the analysis are shown in Table 2.

Table 2: Cases that fit the restrictions and are input for the analysis

Case	Continuity	Sources
AmsterdamA (Cargohopper)	2017 – now	Logistiek (2018b) and University of Amsterdam (2018)
AmsterdamB (University)	2014 – now	Smart City Embassy (2018), Slim en schoon 2025 (2018) and Stichting milieunet (2016)
Brescia	2012 – now	Bestfact (2014a) and Eco-Logis (2018)
Bristol	2002 – now	Scott Wilson (2010), Daniela et al. (2014) and Bestufs (2005)
City Depot (Belgium)	2011 – now	Citydepot (2018), MVOVlaanderen (2018)
City Hub (Netherlands)	2015 – now	City Hub (2018)
Copenhagen	2012 – now	Bestfact (2014b), Pedersen (2012)
Deventer	2011 – now	Stadsdistributie Deventer (2018)
Gothenburg	2012 – now	Bestfact (2014c) and City of Gothenburg et al. (N.d.)
Green city distribution (Netherlands)	2009 - 2016	TLN (2015), Logistiek (2018c) and Logistiek (2018d)
La Rochelle	2001 – now	Patier (2006), Trentini (2015) and Van Duin (2010)
Leiden	1997 – 2000	Quak (2008) and VIM (2010)
Malaga	2004 – now	Epmalaga (2011), Van Duin et al. (2010), Browne et al. (2005) and Trentini et al. (2015)
Milan	2005 – 2008	Bestufs (2007) and Trentini et al. (2015)
Nijmegen	2008 – now	Brown et al. (2012), TNO & Binnenstadsservice (2013) and Van Duin et al. (2016)
Padua	2004 – now	Bestfact (2013a and 2014d) and Cityporto (2013)
ParisA (Distripolis)	2011 – now	Bestfact (2013b) and Geodis (2011)
ParisB (The Green Link)	2009 – now	Bestfact (2014e) and Changemakers (2018)
San Sebastian	2010 – now	Bestfact (2014f) and Txita (2018)
Utrecht	2009 - 2014	Smart City Embassy (2018), Logistiek (2016a) and Bestfact (2013c)

3.4.3 Conditions

This study focusses on the conditions that enable UCC upscaling and enable the persistence of a UCC. Transition theory indicated in chapter 2 that key actor interaction, administrative capacities, public or private ownership and regime powers determine the possibility of scaling UCCs upwards. Every case evaluation or analysis is analyzed to track down the status of these conditions. In addition, the contribution to emission reduction, the contribution to the livability and the durable performance of the UCCs are investigated to determine the successfulness. The cases are grouped in ‘successful’ and ‘unsuccessful’ in terms of the continuity, contribution to emission reduction and livability of a UCC. If a case is still operational, contributes to emission reduction and contributes to the livability, this case is successful. If either one of these restrictions is negative, the case is unsuccessful. The output can show for instance that a number of cases are successful (still operational while contributing to emission reduction and livability) and share a likewise input of a condition, e.g. two actors are involved, or administrative capacities are provided.

In short, the conditions are based on scientific literature on transition theory and UCCs. In Table 3 these relevant conditions and corresponding keywords are made transparent. The keywords are used to find the needed data and are based on insights on UCCs and transition theory of sub-research question 1, see chapter 2. In total, four conditions are part of the QCA. This means that $2^4 = 16$ configurations of conditions are possible (Gerrits & Verweij, 2018).

Table 3: Conditions and corresponding keywords for case evaluation analysis

Condition	Abbreviation for QCA	Keywords
Actor interaction	AI	Actors, stakeholders, participants, parties, executer, retailer, carrier, hauler, receiver, transshipment, partnership, organization, collaboration, arena, interaction
Administrative capacities	AC	Support, funds, money, €, £, revenues, contribution, capacity, information provisioning, data, arena, stimulation, enable, legislation, knowledge, incentives
Degree of public ownership	D	Operator, actors, public, private, owner, stakeholders, partnership, joint, collaboration, organization, cooperation, municipal, city, regional, state, government
Regime powers	R	Rules, legislation, power, policy, incentives, contribution, disincentives, counteract, stimulation, support, capacity, practices, network, organization, rules, resources, funds, oppose

3.4.4 Towards the solution

Table I in Appendix I shows the calibration of the conditions; i.e.: a guide that explains the degree of membership (0, .33, .67 or 1) is assigned to a condition per case. This appendix also elaborates on the information per case and the memberships assigned (see Table II and Table III). Further, Appendix II shows the steps taken in the program fs/QCA in order to arrive at a determination of the necessity and sufficiency of (combinations of) conditions and the solution. Both the complex solution and the most parsimonious solution are extracted from the analysis. The complex solution is barring counterfactuals and most conservative (Ragin, 2017 and Vis, 2012). Whilst in the complex solution all remainders are set to false, in parsimonious solution remainders are used to achieve a logically simpler solution (Ragin,

2017). This, either if it constitutes an easy or difficult counterfactual case. Relevant here is, is that the configurations (i.e. combinations of conditions) with a consistency equal to or above 0.8 are assigned a membership (1) and configurations with consistencies below 0.8 are assigned non-membership (0). The first consistency below arrives at .747, which is considered substantial inconsistent (Ragin, 2017). Moreover, here is a consistency gap of .087001 between the first consistency above. The next gap with a lower consistency is smaller, and cutting off at the next gap thereafter would result in accepting cases with a consistency of .666667. Five cases are substantial inconsistent with the outcome, which all have a membership of $<.5$ in the outcome (successful UCC). The cases are covered in the latter three rows of Table 7 in section 4.2.1.

The frequency threshold is set on 1. This means that all occurrences of combinations of conditions are taken into account, even a combination of conditions is only valid in one case. This results in ten empirically present configurations out of the sixteen logically possible configurations. Of the ten configurations, seven are $\geq .8$ and therefore included in the truth table minimization. For each logical configuration that is empirically present in either one of the twenty cases, a row is reserved in the truth table (see section 4.2.1, Table 7). The consistency indicates to what extent a necessary or sufficient relationship is approached (Peters et al., 2017). Besides consistency, the coverage is shown in the truth table. This number indicates the amount of cases that are covered by the relationship (Peters et al., 2017). The truth table shows that there are no logical contradictions; cases that share the same configuration but have a different outcome. This made recalibration unnecessary (Peters, 2017). When the solutions are extracted from fs/QCA, individual cases in the three paths towards the outcome are inspected. This entails checking whether these cases are actually successful and to what extent they fulfill in the conditions.

The critical combinations of conditions of a UCC that contribute to emission free urban freight transport are explained in section 4.2 and form the answer on sub-research question 3. The combinations of conditions that contribute to durable UCCs contributing to emission free urban freight transport is deduced with this approach.

3.5 Determine stakeholders' needs, roles and resources

In order to give meaning to the extent to which UCC upscaling is feasible with respect to stakeholders' needs, roles and resources of a UCC in Groningen, the fourth sub-research question is answered. As the fourth sub-research question '*what are needs, roles and resources of main stakeholders in using a UCC in Groningen?*' indicates, this question entails not all stakeholders that are involved in urban freight transport, but only stakeholders of UCCs in particular.

3.5.1 Stakeholder determination

The consulted stakeholders are determined with the help of the output of sub-research questions 1 and 3: theory and case evaluations. In addition, independent experts are consulted in order to gain insight in which actors are concerned with a UCC in the city of Groningen. 'Experts' refers to 'persons who are very knowledgeable about or skillful in a particular area' (Oxford dictionary, 2018). Here, the field of urban freight transport and urban planning are the particular areas. Both the research-side (university), the advisory-side (business) and the governmental-side (municipality) is covered. The conversations with the experts took place at their offices. The experts are contacted either in person or via email. Table 4 shows an overview of the spoken experts, the kind of organization they work, the acknowledged expertise and the date of the conversation.

Table 4: Consulted experts

Expert	Organization	Invoked expertise	Date of conversation
Henk Hoekstra	Business	Livability, traffic system	June 14, 2018
Martin Haan	Business	Air quality, emission, electric transport	June 7, 2018
Paul Buijs	University	UCCs, logistics management, physical internet, current practices	August 14, 2018
Rik Timmer	Business	Urban freight transport, local knowledge, effects of UCC (change of logistics system) on stakeholders	June 7, 2018
Sjouke van der Vlugt	Municipality	Local knowledge, goods distribution in Groningen, municipal policy, sustainable city logistics	June 13, 2018

3.5.2 Interviews

To determine the needs, roles and resources of stakeholders relating to the usage of a UCC in Groningen, oral, semi-structured interviews with employees at relevant positions are held. The interviews further shed light on the extent to which stakeholders feel for making use of a UCC, to which they perceive administrative capacities and to which they are subdued to regime pressures. Stakeholders can be defined as *“Those who can influence the project process and/or final results, whose living environment is positively or negatively affected by the project, and those who receive associated direct and indirect benefits and/or losses”* (Li et al., 2012 p334). The information attained from the stakeholders is used to assess the transition of CO₂ emission free urban freight transport by means of a UCC in the current situation of Groningen.

Thanks to information attained by answering sub-research questions 1, 2 and 3, the interviews are more structured (Baarda et al., 2013). Semi-structured interviews are chosen as a method since it enables to ask questions in line with this research while being able to verify, ask further and interpret (non) verbal reactions of the interviewees (Baarda et al., 2013). Surveying for example, does not allow for such actions and observation only provides insight into the current situation and neglects organizations needs and other possibilities (Baarda et al., 2013). The semi-structural nature of the interviews further allows for deviation of the interview protocols (Baarda et al., 2013). The interview protocols ensure the trustworthiness of this sub-question and can be consulted in Appendix III. In order to minimize noise and misunderstandings, the interviews are held in person and in Dutch, since Dutch is for both the interviewees and the interviewer the native language. Except for two interviews, the interviews are held at the offices of the stakeholders. The interview with Karel van der Lingen took place at the office of Sweco Groningen and Dolf Kloosterziel is interviewed at the office of the Chamber of Commerce Amsterdam. To enable interviewees to prepare the interviews and to get the most relevant information, the interview protocol is communicated on beforehand. Additionally, this moment is used to achieve informed consent, where the interviewee is aware of, and agreed on, the goal and usage of the interviews. Conform Verhoeven (2011) her instructions, the letter concerns among others the relevance of this research and indicates the effort the interview asks of the interviewee.

To actual measure what should be measured, known as validity, the interview questions and protocol are checked by both the supervisor of the University as well as the supervisor of Sweco. Further, the interview is tested with a colleague student. In this way, the understandability can be increased and possible misinterpretations can be prevented.

3.5.3 Interviewees

Literature learned that a terminal operator, carriers and local authorities are stakeholders of UCCs. Case study analysis shows that haulers and shop owners are sometimes involved as well. The haulers are represented by the entrepreneur organization Evofenedex, who represents self-transporting and outsourcing companies, and by Transport and Logistics of the Netherlands (TLN), which is an entrepreneur organization for road transport companies and logistics service providers. These organizations advocate the sector's interests, such as a favorable business climate (TLN, 2016) and optimize logistics (Evofenedex, 2018). The shop owners are represented by Detailhandel Nederland (Retail of the Netherlands). This organization advocates shopkeepers on the national scale in their matching interests (Detailhandel Nederland, 2018). The above mentioned actors are also relevant to determine the scalability of the study outcome to other cities.

The municipality of Groningen is an interesting party since theory shows that they can provide administrative capacities. Interviews will show to what extent administrative capacities are provided by the municipality and as such is perceived by other stakeholders. The province of Groningen is not acknowledged since the structure national policy passes this government layer on the topic of urban freight transport. The national and European government are not part of the interviewees since their vision and goals are known and broad and lower governmental authorities are to give meaning to given challenges (KiM, 2017a). Cycloon is a bicycle courier organization. This organization has a stake in this research since it enables emission free last mile transport (Cycloon, 2018a). Cycloon is making use of 'single user' hubs (Cycloon, 2018a). This entails that goods and mail of multiple parties is consolidated and delivered by Cycloon. To make sense of a terminal operator as an actor, the operators of the recently opened consolidation centers in Eelde and Groningen, are acknowledged. Goods hub Groningen-Eelde is a UCC near the city of Groningen and opened in the summer of 2018 (Ghge, 2018). Also in 2018, the UCC Stadsdistributie Groningen (City Distribution Groningen) opened in the fringe of the inner city of Groningen. This initiative serves retailers in a couple of streets. These are moreover stakeholders of a UCC in Groningen since they can support a UCC when there is a relationship.

The acknowledged stakeholders, the corresponding interviewee, his or her function title and the date of the interview are listed in Table 5.

Table 5: Interviewed stakeholders and their characteristics

Stakeholder	Interviewee	Function title	Date of interview
Cycloon	Flip Konings	Company director	October 3, 2018
Detailhandel Nederland	Dolf Kloosterziel	Secretary local interest advocacy	October 2, 2018
Evofenedex	Anonymous	Business consultant	October 4, 2018
Goederenhub Groningen-Eelde (GHGE)	Karel van der Lingen	Company director	October 11, 2018
Municipality of Groningen	Sjouke van der Vlugt	Policy officer city development	October 10, 2018
Stadsdistributie Groningen	Frits Staal	Managing director	November 7, 2018
Transport en Logistiek Nederland (TLN)	Anne-Marie Nelck	Team member market segments and chains	September 27, 2018

3.5.4 Transcription, coding and analyzing

To increase the trustworthiness, explained by Baarda et al. (2013) as minimizing accidental deviations, all the interviews are recorded if allowed and transcribed. The textual data is verified with the interviewees in order to check if the interviewer understood and interpreted them right. In some cases, the transcripts are sharpened or nuanced. The transcripts can be viewed on request by the author. The program Atlas.ti, a form of Computer Assisted Qualitative Data Analysis Software, is used to code the qualitative textual data. Codes as: additional incentives, costs, location, actor interaction, governmental funding, harmonization and regime powers are used to transform data into information for this research question. The codes are based on the interview protocol and research questions (deductive) and on the results of the interviews (inductive) (Verhoeven, 2011). The term that fits here is focused coding (Baarda et al., 2013). Coding enables to show correspondences and differences between interviewees. This is necessary for determining the corresponding or clashing roles and perceptions of stakeholders. The fourth secondary question is answered based on information, gathered interviews and analyzed with Atlas.ti 8.

3.6 Units of analysis

The contextual situation of the city of Groningen, academic papers on urban consolidation centers, urban freight transport, and transition theory, referential studies on the effects of urban consolidation centers, policy documents and the main stakeholders are units of analysis in this research. The political dimension is not limited horizontally. Figuratively spoken, vertically, this research focusses on UCCs in Groningen and its environmental and livability impacts. The inner city of Groningen is defined by the barriers set by the municipality itself, as made visible in the introduction of this thesis. All data is collected from the end of February 2018 until the end of October 2018.

See Table 6 for linkages between the sub-research questions and the needed information, moment of retrieval of the information, the sources of the information, methods for retrieval, documentation method and method of analysis to answer them.

Table 6: Sub-research questions and corresponding answer methods

Question	Information	Moment of retrieval	Source	Method of retrieval	Documentation method	Method of analysis
1. How can UCCs structurally have a role in emission free urban freight transport following insights of transition theory?	Transition theory perspectives in relation to UCCs	August, September	Scientific literature on transition theory and on urban freight transport and on UCCs	Desk research	Write down findings and its corresponding sources	Literature study
2. What are emission free urban freight transport practices in Groningen on the landscape, regime, and niche level?	Scientific- and practice-based literature, visions on urgency according to interviewees	June, July	(Grey) Literature on the impact of emission and urban freight transport. Policy documents. Municipal civil servant	Desk research, conversations with a municipal civil servant and a local carrier	Write down findings, accompanied by references. Notes from conversations, verify used quotes and information	Document analysis
3. Which combinations of administrative capacities, actor interaction, degree of public ownership and regime powers produce successful UCCs?	Conditions of successful UCCs	August, September	Case study documentation, articles on UCCs, expert knowledge	Desk research, conversations	Write down findings and its corresponding sources	Qualitative comparative analysis
4. What are the needs, roles and resources of main stakeholders in using a UCC in Groningen?	Stakeholders of a UCC and their related needs, roles and resources	September, October	Stakeholders, case study evaluation documentation, literature on UCCs	Interviews with a municipal civil servant, local operator and business association employee	Write down findings, transcripts and if allowed recordings from talks, verify used quotes and information	Transcribing, coding, and interpreting

4. Results

In this chapter, the results of the second, third and fourth sub-research question are discussed in respectively section 4.1, 4.2 and 4.3.

4.1 Emission free urban freight transport practices

In this section the results of sub-research question 2, ‘*what are emission free urban freight transport practices in Groningen on the landscape, regime and niche level?*’ are described. First the current landscape of urban freight transport is sketched, secondly, the regime level is paid attention to and thirdly, the niche level with a focus on the city of Groningen is elaborated upon.

4.1.1 Landscape level

Urban freight transport is related to multiple levels. First, there is the landscape, or macro, level, which relates to whole societies and significant large-scale societal processes and institutions (Alexander, 2005). As stated in chapter 1, the current western worldview on climate change and on emissions is subdued to change. As described in chapter 1, this is widely translated in policies and goals. In the Netherlands, the role of the national government on urban freight transport is diminished from 2005 on. Nowadays, the Ministry only is a little engaged in the Green Deal ZES (KiM, 2017a). Urban freight transport is considered to be municipal and business responsibility (KiM, 2017a).

One utility of UCCs is that it contributes to the minimizing emissions that harm people globally. Further, physical infrastructure in the Netherlands relates to the landscape level. Relatively seen, and especially in urbanized areas, many people use (e-)bikes as a mode (KiM, 2018). The last ten years the use of bicycles in the Netherlands grew 12% and people are bicycling further and more often (KiM, 2018). Further, 82% of the goods in the Netherlands is transported via roads, which have to do with the dense road network (CBS, 2018).

4.1.2 Regime level

Since environmental problems, both in the living environment and sustainability aspect of the word, are identified and interventions are to be formulated and implemented, desired outcomes are pursued by means of governing (Bulkeley et al., 2016). In light of upscaling a UCC, it is key to understand governance activities and place regime level incentives and constraints in the context of Groningen.

4.1.2.1 The governance side of urban consolidation centers

Norms, values and beliefs frame regulations and transport policies, which in turn determine the playing field of governance (Dowling, 2018). Alexander (2005) defines that the meso level (where regimes operate) includes the implementation of structures and processes. Industrial regime actors argue that a ‘technological fix’ will be sufficient for emission free urban freight transport. However, like environmentalist studies show that this will not fully cope with the environmental issues, the municipality of Groningen enables a transition. Giddens (2009) argues that in light of climate change, a state has to facilitate, or has to “*stimulate others to action and then letting to get on with it*” (Giddens, 2008, p.9). In the city of Groningen, this is manifested in the vision document ‘Destination inner city’ and its corresponding implementation program (Municipality of Groningen, 2016, VNO-NCW Noord,

2018). Topping on this, Giddens argues further that a state also should be ‘ensuring’ in terms of being capable of producing defined outcomes (Giddens, 2009). The extent to which the municipality of Groningen, as a subsidiarity of the state, will ensure a CO₂ emission free inner city as a defined outcome, can be measured after 2025.

As described above, strict policy is set on a national and supranational level which makes the term ‘constitution writing’ applicable (Flyvberg, 1998 & McCormick, 2007). This term articulates well with the term ‘strong government’ as a governing extreme (Jordan et al., 2005). The label strong government is however not properly applicable since social actors and networks are governing as well: a UCC can be arranged without governmental involvement (Allen et al., 2015). Also, using terms of Osborne and Gaebler (1992), the national government is steering above rowing by setting policy goals. The province of Groningen (2014) is not providing specific policy for urban freight transport, but there is a focus on limiting energy demand in terms of fewer vehicle kilometers (province of Groningen, 2014). The municipality of Groningen is both steering and rowing. Namely, by using time windows, a digital maintaining system and similar controlling and monitoring instruments next to into policy intertwined goals (Municipality of Groningen, 2018a). This way of governing seems an operating standard, as Kloppers (2008) found that in many UCCs, the public transport authority uses additional restrictions on other logistics services to encourage the use of the UCC. Moreover, the municipality signed a covenant concerning sustainable urban freight transport with parties as business associations (Municipality of Groningen, 2018b)

Despite the capacities and resources of regime level institutions seep through multiple levels, arguable is that the creation of a UCC in Groningen is mainly covered in the niche level.

4.1.2.2 Vehicle industry

Emission free transport vehicles are available in multiple shapes and sizes and its utility is improving. Bicycle couriers as Cycloon and GoFast can provide logistics services without emission and national operating logistics service providers deliver mail with electric vehicles as the ‘e-cargo bikes’ and ‘container-bikes’ (Cycloon, 2018b, GoFast, 2018, PostNL, 2017 and DHL 2017). The type of cargo bike that Stadsdistributie Groningen (see section 3.5.3) makes use of is shown in Figure 9.



Figure 9: An example of a cargo bike (contenderbicycles, 2018)

Since vans contribute for 75% of the vehicle kilometers in Dutch city logistics, there is space for growth of the share of electrically driven vans (TNO, CE Delft & Connekt, 2018). In 2017, only 0.8% of the sold vans is electric driven (CEDelft, 2017). Literature is not corresponding, but in the most positive estimation, the research consortium (2018) found that 20% of the new sold vans in 2025 are electrically driven. At the moment, electrical vans are already active in Groningen. According to the driver of the vehicle in Figure 10, this vehicle drives approximately 30 kilometers a day, while the range is about 70 kilometers with a full battery (DHL Driver, June 21, 2018, personal communication). UPS is currently testing vans with a range of 240 kilometers and tests are taking place with ‘Autonomous logistics electric entities’, which can drive independently through a city (Logistiek, 2018e and Fraunhofer, 2018).

Another side of the story is that the supply of electric vans for private individuals is limited, relatively costly and have a notable delivery time (personal communication Paul Buijs, August 14, 2018). Long-haul emission free trucks are not operational at this moment, however, there are developments in this sector. A Dutch logistics service provider performs urban freight transport with electric 19 tons trucks (Breytner, 2018). Among others Volvo, Tesla and Volkswagen are testing electric trucks with a range of approximately 400 kilometers and Toyota focusses on a hydrogen truck with a range of 480 kilometers (Bloomberg, 2018 and De Ingenieur, 2018).



Figure 10: Emission free urban freight transport in the city of Groningen (Author, 2018)

4.1.2.3 The governance of the vehicle industry

As described above, supranational and national governments make policy that contributes to emission reduction. Furthermore, the vehicle industry is making progress by innovating with emission free vehicles. However, national governments with a large automotive vehicle industry are reluctant in sharpening CO2 diminishing policies on a European level (de Volkskrant, 2018).

4.1.3 Niche level practices

The introduction of this study shows that sustainability issues are urgent and transport has a reasonable impact on the environment. In the Netherlands, the contribution of transport to pollution in terms of greenhouse gas production is 20% (Rijksoverheid, 2018). In Groningen, set policy goals are given meaning through the by Green Deal Zes collaboration initiated approaches. Similar with transport and logistics executing interest organizations, the municipality of Groningen strive for emission free inner city logistics (FD, 2017, Evofenedex and TLN in Bci, n.d., Municipality of Groningen, 2017b). In its energy-program for 2015-2018, the municipality of Groningen argues for the importance of innovation in the energy transition (Municipality of Groningen, 2015). The municipality further explains in this document that it takes a new role as it will stimulate, support and facilitate small scale initiatives.

Besides preventing the ecological impacts of greenhouse gas emission, enhancing the livability for pedestrians in inner cities is an objective of the municipality of Groningen (Municipality of Groningen, 2016, 2017). At this moment, trucks are not allowed to enter the inner city of Groningen between noon and 05.00 am (Municipality of Groningen, 2018). Emission free vehicles are not dependent on this time window. Despite the time window restriction and conform Quak's (2008) line of reasoning about road

network density, goods provisioning of inner city retailers in Groningen is mostly fulfilled with trucks. The amount of unloading trucks is negatively affecting the quality of life of the inner city (DvhN, 2017, Municipality of Groningen, 2016). Arguable is that ‘good spatial planning’, of which municipalities are held responsible for, should lead to livable inner cities (Section 2.1 Wro 2006). More livable inner cities result in attracting businesses, inhabitants and tourism, which result in municipal revenues (Platform31, 2014).

With setting up a UCC, the current interorganizational logistics network may transform; other modes, routes, schedules and transshipments will be used. Also, organizations may be created or transformed; with an operational UCC, tasks and expectations of transport organizations and carriers change. On the meso level is the increase in benefits of UCCs due to incentives and constraints in the form of executing policy possible. The niche level concerns “*semi-formal or informal social units, processes and interactions, such as committees, teams, task forces, work groups etc*” (Alexander, 2005 p215). This level is relevant in understanding the role of retailers in the inner city. At this scale committees or likewise can help streamline needs and expectations toward suppliers. In 2014, 54 parties signed the ‘Green Deal Zero Emission Stadslogistiek’. The municipality of Groningen committed itself, next to other municipalities, the national government, haulers, carriers, car manufacturers, research institutions and trade organizations to emission free city centers (Municipality of Groningen, 2017b). In the summer of 2018, the municipality of Groningen arranged a covenant together with stakeholders of inner city logistics in Groningen. The parties will act in multiple workgroups to explore ways of coping with the restriction of CO2 emission interdiction. One of the workgroups focusses on UCCs (Municipality of Groningen, personal communication June 2018). Parcel related processes and interactions between suppliers, retailers, the transship organization and carriers are activities related to a UCC and pertain to the niche level as well. Since 2015, the municipality is working on a pilot of a UCC in Eelde, province of Drenthe. On June 20, 2018, the UCC, or ‘goods hub’, Groningen-Eelde started. Despite this UCC is located in the province of Drenthe, it will mainly serve the City of Groningen, which is in the likewise named province. Also, a pilot of a UCC in the inner city of Groningen, which participates in the Interreg SURFLOGH (Smart Urban Freight Logistics Hub) program, has started (Municipality of Groningen, 2018a). In practice, this UCC is a storage of a shop, used as a mini warehouse for nearby located shops.

4.1.3.1 *Alternative and complementing niches*

Alternative and complementary innovative forms of emission free transport are the use of drones, hyperloops, 3D-printing and communicating infrastructure and physical internet.

Hyperloops are fast, not yet in use, the needed infrastructure is costly, and the transport mode has less potential in areas with highly developed infrastructure (Ross, 2016). Drones can be considered as a more serious alternative since multiple (transport) organizations are exploring the possibilities for goods supply (The Conversation, 2018). In dense areas, parcel delivery drones have potential (KiM, 2017b). However, comparing transport by drones with electric truck transport, the latter is more efficient and cleaner (Stolaroff et al., 2018, KiM, 2017b). The knowledge institution (2017b) shows that the further away a delivery destination is from a UCC, the more beneficial delivery vans are. UCCs can have a role in home delivery by drones when a city is covered by multiple UCCs (KiM, 2017b). Drones are not dependent on current road infrastructure in the last mile but do have a spatial impact. Delivery in urban areas is labeled as a challenge, but landing on columns that functions such as a pickup point can be an outcome (KiM, 2017b).

3D-printing can be considered as a partial substitution for urban freight transport. The benefits of creating products at home are that production is becoming cheaper and the range of printable items is wide. However, the literature shows that 3d printing especially has potential in technology firms and in construction (Seit, 2017 and Mendoza, 2018). Moreover, 3D printing is considered as additional instead of substitutive (Leach, 2014).

Intelligent traffic regulation systems, or traffic lights, can change traffic flows based on data by prioritizing, optimizing and informing. Data can, for example, come from in-road vehicle detecting loops, navigation systems, smartphones, cameras and communicating vehicles. In Apeldoorn for example, thanks to these intelligent systems, electric trucks can get priority over other vehicles at intersections (personal communication Reza Kamerbeek, May 18, 2018). This improves air quality, makes logistics more efficient and possibly decreases the time span that a truck is in the city center. Consolidated transport via electric vehicles or bicycles between UCCs and the inner city guided by smart infrastructure can be more efficient than being depended on the current traffic flows in the city of Groningen. Communicating vehicles, or ‘cooperating intelligent transport systems’, singly can promote safer, more efficient and environment-friendly solutions for transport compared to less sophisticated applications (Váradi et al., 2015).

Physical internet efforts can contribute to enabling CO2 emission free inner city logistics with help of a UCC. The idea of physical internet is using open and connected logistics service networks, where objects are transited, stored, delivered and used (Logistiek, 2016). According to Vis (2018), with physical internet, logistics is self-organizing, modes and storage space are shared and parcel moves freely through the connected networks. The specialist journal (2016) explains that physical internet enhances higher efficiency by making use of smaller containers, which diminishes transportation of air and enables bundling. During the International Physical Internet Conference in June 2018, researchers, governments and business argued that future logistics is formed by communicating logistics and shared transport modes and warehouses (NRC, 2018).

In the next section, the results of the third sub-research question are discussed.

4.2 Combinations of conditions of successful UCCs

This section shows the results that correspond with the third sub-research question: ‘*which combinations of administrative capacities, actor interaction, degree of public ownership and regime powers produce successful UCCs?*’. The input for the question are the twenty case analyses. As described in section 3.4.3, the twenty cases, associated by evaluations and information, are input for the qualitative case comparison. The information provide information about at least administrative capacities, the ownership, the interaction between actors, and regime powers.

4.2.1 Interpretation

A case is determined successful if it is:

- Contributing to the livability in the urban area;
- Contributing to emission reduction in the urban area, and;
- Still operational.

The case analyzes indicate that sixteen of the twenty UCCs, that are part of the QCA analysis are successful. All analyzed cases (did) contribute to an emission reduction, This is achieved either by using fuel and engine types that diminish the emission relative to regular fossil fuels, or by ensuring better loaded vehicles for last-mile transport to reduce the total made kilometers. Allen et al. (2012) showed that reduction in total freight vehicle trips and kilometers result in air pollution reduction. Less air pollution and fewer trucks, in turn, result in a higher livability. The amount of emission reduction by the UCCs is measured in different ways. In this analysis, no attention is paid to the amount of emission reduction, but insight in the direction of the effect is provided.

4.2.1.1 Configurations

The truth table, Table 7, covers all empirically present configurations, i.e. “*all possible combinations of causal conditions*” that are covered by the either one of the twenty cases (Ragin, 2017). The truth table shows that there are ten configurations found, of which seven are above the consistency gap and the consistency threshold of 0.8. This means that configurations that have a consistency score equal to, or above 0.8, are considered successful, and the configurations with a consistency lower than 0.8 are considered unsuccessful.

Table 7: Truth table with successful as outcome, retrieved from fs/QCA (Ragin, Davey & Drass, 2017)

Administrative capacities	Actor interaction	Degree of public ownership	Regime powers	Successful	Cases	raw consist.	PRI consist.	SYM consistency
1	0	0	0	1	City Hub, Deventer, ParisA	1	1	1
1	1	0	0	1	AmsterdamB, ParisB	1	1	1
1	0	1	0	1	Malaga	1	1	1
1	1	1	0	1	San Sebastian	1	1	1
0	1	0	1	1	City Depot BE	1	1	1
1	1	0	1	1	AmsterdamA, Bristol, Gothenburg, La Rochelle, Nijmegen, Utrecht	0.881834	0.881834	0.881834
1	0	0	1	1	Copenhagen	0.834171	0.834171	0.834171
0	1	0	0	0	Green City Distribution	0.74717	0.74717	0.74717
1	1	1	1	0	Brescia, Leiden, Padua	0.666667	0.666667	0.666667
1	0	1	1	0	Milan	0.24812	0.24812	0.24812

The UCC in Utrecht failed, nevertheless, its configuration has a consistency of $>.8$ and is the same as five other cases that are successful. The other way round is true for the cases Brescia and Padua: the case study analysis show their successfulness, whilst they share a configuration with a consistency of <0.8 with the unsuccessful case of Leiden. To determine the cause of the contrast in the successfulness of the cases in the same configuration, attention is paid to the cases.

The case of Utrecht is clearly the odd man out. The private led UCC interacted with shippers and retailers, received provincial subsidies for research and municipal subsidies in the concept phase. Further, the emission free electric vehicles were not dependent on environmental zones and time windows, and were allowed to use bus lanes. The UCC however, withdrew from Utrecht because it was not financially viable. Besides, multiple parties accused the organization of incorrect usage of subsidies. The profitability of additional incentives in Brescia and Padua, as well as in Milan, Malaga and San Sebastian are possibly limited since regulations as time windows generally seen in Spain and Italy lack enforcement (Muñuzuri et al., 2012). It is striking that exactly the cases of Brescia and Padua have a full membership in all four conditions. The calibration of the conditions in Appendix I, Table I, show that both cases have a full membership in administrative capacities and regime powers, and a ‘more in than out’ membership of 0.67 in the degree of public ownership. The case of Brescia has a full membership in actor interaction as well, whilst the case of Padua leaves this condition with a membership of 0.67. Interesting is that the case of Leiden shares the configuration but is unsuccessful. This UCC was operational from 1997 until 2000. There was interaction with haulers and carriers that did not meet the

vehicle restrictions but did want to deliver in the environmental zone. Additional incentives, such as exemptions for time windows, were considered unfair and caused resistance. The vehicles of the UCC in Leiden were electric driven and were accused to slow down other traffic. Also, the UCC lacked volume and was strongly dependent on subsidies. It is imaginable that the portrait of the era is striking in the successfulness: vehicle technology and sustainability perceptions of stakeholders did change since then. Despite, the UCC in Padua is operational since 2004, which proves that only four years later it was technically possible. The occurrence of a decisive change of sustainability perceptions in this period is objectionable as well.

4.2.1.2 Solution

The seven configurations are minimized conform the complex solution and the parsimonious solution. In Table 8 the complex solution is made visible. Here, QCA terminology is used. The asterisk (*) is for 'and', and shows the configurational causality: the causality of combinations of conditions that result in a successful UCC. The plus (+) is for 'or', showing the equifinality: multiple configurations lead to a successful UCC. With the help of this terminology and the abbreviations shown in the first column of Table 8, the solution paths (the logical configurations that produce a successful UCC) can be represented as follows:

$$AC^* \sim R + AC^* \sim D + AI^* \sim D^* R \rightarrow \text{Successful UCC}$$

This solution means that three mutually non-exclusive combinations of conditions logically result in successful UCCs, namely: a combination of administrative capacities and no regime powers; a combination of administrative capacities and a low degree of public ownership; or a combination of actor interaction, a low degree of public ownership and regime powers.

Table 8: Complex solution from fs/QCA

Path	Raw coverage	Unique coverage	Consistency	Cases (membership >.5)
AC * ~R	0.293125	0.063125	1	AmsterdamB, City Hub, Deventer, Malaga, ParisA, ParisB & San Sebastian
AC * ~D	0.625625	0.083125	0.909173	AmsterdamA, Bristol, Copenhagen, Nijmegen, Utrecht, AmsterdamB, City Hub, Deventer, ParisA, ParisB, Gothenburg & La Rochelle
AI * ~D * R	0.354375	0.041875	0.894322	Bristol, City Depot BE, AmsterdamA, Nijmegen, Utrecht, Gothenburg & La Rochelle
Solution coverage: 0.730625 Solution consistency: 0.921198				

The analysis of the truth table in fs/QCA reveals that there is no condition that is in each of the three paths, see the first row in Table 8. This means, there are no conditions that need to be present to achieve a successful UCC (Ragin, 2017). The necessity analyses, see Appendix II.I, ratifies this by not showing consistency scores equal to, or above the consistency threshold for the necessity of 0.9.

The QCA solution, see Table 8, shows that neither a sufficient condition is present; there is not one condition that can produce the outcome by itself (Ragin, 2017). The complex solution further points out that there are three different paths that result in successful UCCs. These conditions; administrative

capacities, (~)regime powers, ~degree of public ownership and actor interaction, are INUS conditions. INUS conditions are Insufficient but Non-redundant parts of a configuration which is itself Unnecessary but Sufficient for the occurrence of the outcome (Mackie, 1974).

Table 8 further indicates the consistency and coverage of each path (third, fourth and fifth column) and the solution as a whole (last row). The consistency scores explain the degree to which membership in the solution paths and the solution as a whole are subsets of the outcome (Ragin, 2017). The consistency of the first path is 1. The cases all have a ‘more in than out’ membership of 0.67 in administrative capacities and no membership (0) in regime powers. This means that the UCCs in these cases and/or its users are benefitting from additional incentives such as exemptions for time windows, environmental zones or bus lanes, whilst no governmental funding is provided and neither there are non-governmental funds provided, see Appendix I, Table I. The second solution path is with a score of 0.909173 less consistent. All twelve cases that belong to this path benefit(ted) from administrative capacities (a membership of 0.67). Moreover, seven of them take advantage of governmental subsidies as well (a membership of 1). Lacking a degree of public ownership is the other condition in this path. In the UCC of Gothenburg, the city government is part of the private owning organization. The UCC in La Rochelle was publicly owned first, but nowadays is privately led. Both result in a membership of 0.33 in the degree of public ownership. The ten remaining cases that have a membership in this path all are owned by a private party or private parties (a membership of 0). The last solution path is almost as consistent as the second path. This path introduces the importance of actor interaction. In four cases both haulers, carriers and receivers are involved. In the remaining three cases; AmsterdamA, Nijmegen and Utrecht, only two of those stakeholder groups are involved. As in the second solution path, lacking a degree of public ownership is relevant in the third path as well. In this path, Gothenburg and La Rochelle are again the only two cases that do not have a membership of 0 in this condition. All seven cases that have a membership in this path are benefitting from non-governmental financial support (a membership of 1 in regime powers).

The solution consistency of 0.921198 indicates that there is only a little refutation within the set. The coverage scores indicate to what extent the solution paths and the solution as a whole cover the outcome (Ragin, 2017). The raw coverage indicates that the proportion of memberships in a successful UCC of sec the first path is 0.293125 (Ragin, 2017). The unique coverage of 0.063125 is the proportion of memberships in a successful UCC of the first path, that is explained solely by each individual solution term (Ragin, 2017). The proportion of memberships in a successful UCC of the second and third path is respectively 0.625625 and 0.354375. The proportion of memberships that are not covered by the other two solution paths, is 0.083125 for the second path and 0.041875 for the third path. The solution coverage of 0.730625 is the proportion of memberships in the outcome, explained by the complete solution (Ragin, 2017).

The parsimonious solution is simpler than the complex solution above. The parsimonious solution, see Table 9, can be noted as the following formula:

$$AC*\sim R + \sim D*R \rightarrow \text{Successful UCC}$$

The parsimonious is a subset of the complex solution. According to the parsimonious solution, the condition actor interaction is not an INUS condition, in contrast to the complex solution. The first solution path, see Table 9, is exactly the same as the first path in the complex solution. The second solution path of the parsimonious solution is the same as the third path of the complex solution, except for that the condition actor interaction is dropped. This makes that the second solution path of the parsimonious solution has a larger coverage and a lower consistency than the third solution path of the complex solution. The case of Copenhagen fits in second path of the parsimonious solution, in addition to the seven cases that are in the third solution path of the complex solution as well.

Table 9: The parsimonious solution from fs/QCA

Path	Cases (membership >.5)	Raw coverage	Unique coverage	Consistency
Administrative Capacities * ~Regime Powers	AmsterdamB, City Hub, Deventer, Malaga, ParisA, ParisB & San Sebastian	0.293125	0.293125	1
~Degree Of Public Ownership * Regime Powers	AmsterdamA, Bristol, City Depot BE, Copenhagen, Nijmegen, Utrecht, Gothenburg & La Rochelle	0.4375	0.4375	0.875
Solution coverage: 0.730625 Solution consistency: 0.921198				

4.2.2 Conditions in practice and literature

This section pays attention to the results of the QCA in relation to the theory. This section is structured by the conditions which the theory revealed, respectively: administrative capacities, actor interaction, regime powers and the degree of public ownership.

4.2.2.1 Administrative capacities

Both the complex solution and parsimonious solution prove the correctness of the theory, namely, both solutions show that administrative capacities are supportive to niche level initiatives such as UCCs. In two of the three paths that produce successful UCCs in the complex solution, membership in administrative capacities is relevant. Administrative capacities entail additional incentives, governmental funds, information provisioning and the setting up of arenas. In the cases part of this QCA, the capacities consist of additional incentives and municipal, city, regional or national funds. Whilst theory refers to information provisioning and arena setting as administrative capacities as well, not one case reinforces this. Despite, it is imaginable that governments did provide arenas where collaborative interaction took place.

Provided funds are directly in favor of the UCC and its users, while incentives as exemptions are profitable for the performance of a UCC specific, as well as for the use of emission free vehicles in general. Paul Buijs, Assistant Professor Sustainable Logistics at the Faculty of Business of the University of Groningen, explains that the profit or costs of the usage of UCCs is strongly dependent on the time a truck driver is in the city (Buijs, personal communication on August 14, 2018 and November 9, 2018). His argumentation is that a truck and a driver that costs €60 per hour, and which spends 45 minutes to drive into and outside the city plus 15 minutes for stopping at shops, costs (45+15 minutes =) €60. If a UCC accounts €15 per roll container, one will only use the UCC when delivering less than (€60/€15 =) 4 roll containers. In multiple cases, the costs of the usage of UCC are raising: the use of a UCC resulted in 12% higher transport costs in Padua, and in La Rochelle transport between the UCC and the inner city costs €3.75 per parcel (Cityporto, 2013 and Van Duin et al., 2010). Transport and Travel Research Lt. (2010) found a funding role for central or local governments in order to let a UCC succeed. This funding should be spent on trials and feasibility studies. According to Civitas (2015, p42), the focus should not be on funds, but “city authorities should focus on providing incentives to encourage the use of UCCs through regulatory differentiation in favor of vehicles operating from UCCs, rather than direct capital and operating subsidies to private-sector operators”.

Also in terms of administrative capacities, municipalities and city councils provide exemptions for time windows, pedestrian or low emission zones and permission for usage of bus lanes for UCCs making use of electric vehicles. A low emission zone is an area in the inner city where vehicles have access restrictions to diminish fine particles and emissions (Milieuzones, 2018).

4.2.2.2 Actor interaction

Theory argues that interaction between actors is relevant in upscaling UCCs from the niche to the regime level. Literature and case studies learn that a terminal operator, carriers, shop owners, haulers, and local authorities are stakeholders of UCCs. Erdinch & Huang (2014) found that a stakeholder can have a crucial role in achieving an outcome. According to Erdinch & Huang (2014), stakeholders should be attracted by a mechanism since governments can and should not force stakeholders to participate. They warn however, that in urban freight transport innovations, there are always conflicting interests of different stakeholders. Based on 114 UCCs that either serves a large site, an urban area or a construction site, Allen et al. (2012) argue that UCCs are only profitable if the operator controls all the potential receivers and carriers, which is achieved a little at UCCs serving an urban area as an inner city.

Table 8 shows that in one of the three paths actor interaction contributes to producing successful UCCs. In the cases with a membership in this path, interaction takes place between two or three actor groups and the UCC. This is in line with theory, that sets the urgency of actor interaction for upscaling niche level initiatives to the regime level. Despite, the parsimonious solution does not show actor interaction as a condition that is needed to produce successful UCCs. With respect to this solution, there is no need for actor interaction to produce successful UCCs. When getting back to the cases, one indeed finds that five of the six cases with a UCC interacting with only one actor (a membership of .33), are successful. Nevertheless, all of eight cases wherein there is interaction between the UCC and three actors turn out to be successful.

4.2.2.1 Regime powers

Regime powers can be recognized in opposing and supporting parties and in financial support of other parties than governmental parties. Regime powers are often not discussed clearly in evaluations. However, evaluations of UCCs show that all unsuccessful UCCs either have too high initial and operating costs or were subject to dissatisfaction among and opposing of third parties. The UCC in Milan was a promising project that distributed a broad range of products successfully (Trentini et al., 2015). The organization was accused by hauler associations of infringing job hire regulations, was subject to management frictions due to political appointments and incomplete liberalization of access to road transport market in Italy prevented the organization to become a freight transport company (Bestufs, 2007). The UCC in Leiden was not financially viable, the transport industry was reluctant in using the UCC, the UCC was accused of disturbing traffic flow and the additional incentives were perceived to be unfair (Schoemaker, 2002). These reproaches indicate constraining power exercise of incumbent regime actors, which is in line with the theory. In the cases above, existing regimes are powerful in persisting current practices.

This QCA covers regime powers in terms of non-governmental funding. Funds from other parties than governments, as well as governmental subsidies, are supportive to UCCs. In both the complex and the parsimonious solution, membership in regime powers in combination with other conditions produce the outcome, as well as non-membership in regime powers in combination with a certain condition, produce the outcome. Thus, non-governmental funds can both be applicable and not applicable, and still may produce a successful outcome, depending on the membership on the other conditions. Grasping back to the theory, provisioning of funds is a sign that there are regime level actors who do not believe that technological innovation solely will suffice for sustainable transport. Moreover, regimes seem to enable the transition of UCCs with funding in some cases, which is directly deducible from the theory.

In addition to governmental (administrative capacities) and non-governmental (regime powers) financial funds, the twenty analyzed UCCs could have made use of European Union funding programs (e.g. Research and Innovation framework programs, Horizon 2020, VIVALDI, Renaissance and Urbact III) (European Commission, 2018 and Civitas, 2018). These programs, for example, subsidize electrical vehicles. Despite the conditions to claim subsidies are clear, the vast majority of case evaluations are not transparent in if they received European funds.

4.2.2.2 *The degree of public ownership*

The assumption that involvement of a public party in the ownership of a UCC is favorable for upscaling UCCs from the niche to the regime level, can be disapproved by the complex solution. Namely, in two of the three paths towards successful UCCs with respectable consistency and coverage proportions, no public party is involved in the ownership of the UCC (anymore). Evaluations of cases that have a (more in than out) membership in the degree of public ownership, unanimous reason that the neutral, or ‘white label’, character of the UCC is decisive (if a reason is given). This strives with the idea of CO3 (2014) that such ‘horizontal collaboration’ ask for a neutral third party. CO3 argues that this is especially relevant when parties are operating in competing markets or when confidential data is applicable. Lindawati et al. (2014) did find that sharing information is a barrier for collaborative urban transport initiatives in Singapore. The theory that close cooperation between public and private parties supports niche level initiatives, cannot be denied. However, the QCA proved that this cooperation definitely should not take shape in the form of a public or public-private ownership. Theory shows that public and private actors together take spatial initiatives. This can be recognized in the cases. Nevertheless, the QCA shows that interaction between public and private actors, in the form of ownership of UCCs, does not lead to successful UCCs.

In the next section, the results of the fourth sub-research question are discussed.

4.3 Stakeholders’ needs, roles and resources

The fourth sub-research question is to get an understanding of the needs, roles and resources of main stakeholders relating to a UCC in Groningen. This section as well is structured by the conditions, respectively: administrative capacities, actor interaction, regime powers and the degree of public ownership. Because the results of the interviews give reason to, additional conditions are described subsequently in section 4.3.5. The results of most stakeholders are scalable to other Dutch cities that strive for emission free urban freight transport, such as Zwolle, Deventer, Enschede, Den Haag, Rotterdam, Amsterdam, Arnhem, Delft, Haarlem, Maastricht, Nijmegen, Tilburg, Utrecht (Greendeal ZES, 2018), because nationally operating interest representation organizations are acknowledged above locally operating parties. This, except that the municipality of Groningen is the only governmental body acknowledged.

The text in section 4.3.1, 4.3.2, 4.3.3 and 4.3.4 is based on interviews with stakeholders and respectively pays attention to administrative capacities, actor interaction, regime powers and additional relevant issues. All interviews are held in Dutch, therefore the text is translated into English by the author. The representatives per organization are elaborated upon in section 3.5.3.

4.3.1 Administrative capacities

The first condition, administrative capacities, entail enabling funds, providing knowledge and information, setting up arenas for collaborative interaction and adding, changing or removing legislation, see section 2.2.

The representative of the municipality of Groningen explained that its role is primarily in laws and regulations. In addition, the municipality declares to be responsible for enforcement of the regulations. Nowadays, the municipality of Groningen is considering additional regulation instruments to stimulate emission free urban freight transport. According to the representative of Detailhandel Nederland, laws and regulations determine for an important share the consumer's attitude. He continued with the example that in other nations, shops are situated in the periphery due to regulations. These locations are more easily accessible by car. How consumers will act, for example driving to supermarkets often, or letting groceries delivered home, will differ over places. This idea is strengthened by the representative of bicycle courier organization Cycloon. The interviewee argues that Groningen is a bicycle city and that this is determined culturally; there is a large group with a certain education and age, in combination with a compact city where everything is very accessible by bicycle. The representative of Detailhandel Nederland explains that laws and regulations influence the possibilities of organizations as well. The representative of the bicycle courier organization argues that the current political situation in the municipality of Groningen is beneficial for them since from 2025 on urban freight transport has to be emission free. If there was not a leftwing political party in the lead, the situation would possibly be different is a statement made by both the representative of Cycloon and the representative of the Municipality. However, the bicycle courier organization prefers even stricter clean transport requirements.

Legislation and regulation are instruments that affect urban freight transport. Additional incentives exist in multiple forms, for example by the exemption of time windows and access to bus lanes. The representative of TLN advocates for privileges for companies that invest in zero emission vehicles nowadays. The representative of Evofenedex explains that parties that work in a sustainable way or make use of silent vehicles, may make use of bus lanes and parking spaces or may deliver on other times in certain cities. The representative of Detailhandel Nederland suggests that, in this transition phase towards zero emission freight transport, city governances should not prescribe what they want precisely, but should prescribe what the framework is.

The representative of the municipality of Groningen clarifies that the sizing and arrangement of the time window area is a role of the municipality. The interviewee indicates further that the time window area in Groningen either stays the same or will be enlarged. When talking about time windows, interviewees show their understanding, but most of them seem critical as well. The representative of TLN for example, explains that the net time window is often shorter than the gross time window since retailers are mostly available to receive freight from 09.30 hours on. The interviewee added that around 09.00 o'clock it is busy in inner cities because students are bicycling through the city. The representative of Evofenedex sees the constraint of time windows as a chance for the usage of a UCC; a UCC would probably make delivery within a time window easier. In line with this, the representative of Detailhandel Nederland explains that UCCs can be a solution for environmental zones, especially for small entrepreneurs. The interviewee added that broadening of time windows for emission free transport is beneficial for supermarkets. The representative of Cycloon refers to the fact that, when excluding exemptions, time windows result in a transport vehicle free inner city outside the time windows. However, the representatives of both Cycloon and TLN explain the amount of transport movements is larger in total: more vehicles have to be taken in use in order to deliver the orders within the time frame. The representative of GHGE stresses the importance of time windows in stimulating emission free inner city transport. In line, the representative of Stadsdistributie Groningen emphasized that such instruments are relevant to the functioning of the UCC. Moreover, the interviewee recognized that maintenance is needed to make sure that restrictions are complied to.

At this moment, there is no intention of the municipality of Groningen to provide subsidies in order to stimulate emission free urban freight transport. The representative of the municipality argues that this could be a job for the national or European government. The members of TLN prefer a workable or profitable situation above receiving subsidies (Interview TLN, September 27, 2018). According to the

interviewee, a ‘start’ subsidy to start something new, is acceptable. The representative of Evofenedex is skeptical about subsidies because usage of UCCs should be possible and self-supportive.

Despite omitting subsidy provision, the Municipality of Groningen creates an arena by proactively explaining their desire of an inner city that is free of emission. The representative of the Municipality explains further that they are interacting with the parties that wants the same. The owner of the UCC GHGE recognizes this strong desire of the municipality of Groningen, among others by means of the current policy. The initiator of Stadsdistributie is in close contact with the municipality and stresses the usefulness of their network provisioning.

Referring to knowledge and information provision, both the road transport companies and logistics service providers (represented by TLN), the self-transporting and transport outsourcing companies (represented by Evofenedex) and the retailers (represented by Detailhandel Nederland) seek for clarification of the area where pollution vehicles will be prohibited. This means information about the boundaries of the area and the restrictions on the extent to which pollution is allowed. According to the representative of Evofenedex, lack of clarity leads to postponement of investment in vehicles that are cleaner. Further, both the representative of TLN and Detailhandel Nederland stress the importance of harmonization of area restrictions on a national scale. The interviewed civil servant of the municipality of Groningen explains that non-zero emission vehicles are prohibited from 2025 on. The exact area and its restrictions are not clear yet. What the representative of the municipality made clear, is that the current time windows and privilege policy for electrical vehicles are set until 2020, and the adjustments towards emission free urban freight transport in the inner city will be implemented stepwise. Moreover, the representative of the Municipality explained that they strive for a national standard as well, which can be applied to every city. Here, the representative of the municipality of Groningen shows agreement on harmonization between cities. However, a national harmonization suggestion for step-by-step ruling out certain Euro norms is not adopted by the municipality Groningen, because the air quality is argued to be clean there (Interview Municipality of Groningen, October 10, 2018).

4.3.2 Actor interaction

On the condition actor interaction, the representative of bicycle courier organization Cycloon indicates that their current focus is on large haulers, which drive into the inner city for a couple of collies that are open to bicycle transport. The representative of GHGE makes a distinction between national haulers and local retailers. For bundling, the focus of GHGE is on the haulers, while the UCC focusses on the retailers with service provision (Interview GHGE, October 11, 2018). Both interviewees stress the urgency of customized service in addition to transport. The representative of Cycloon explains that an other parcel delivery organization is not willing to cooperate because of this service; that organization strives for ‘dedicated’ transport, which means that every handling is executed by this organization and the clients can see this. This is remarkable since the representative of Detailhandel Nederland explains that for entrepreneurs it is mainly relevant that goods are delivered on time and in the right condition. The representative of Evofenedex sees that the parties that provide additional services for the retailers are hard to involve in a UCC.

As described above, the municipality of Groningen sets an arena for collaboration. The representative of GHGE explains that the municipality brought GHGE in contact with other initiatives, entrepreneurs and entrepreneurial associations. The owner of the UCC declares further to be in touch with the municipality of Groningen to collaborate on a commercial basis, or in words of the Municipality: “*to be a launching customer*”. Next to entrepreneurs and the municipality, GHGE interacts with multiple educational institutions. Moreover, the representative of GHGE argues that being part of Goederenhubs, which is a network of UCCs, is very important to the UCC. Hereby namely, GHGE is part of a brand; it is not a stand-alone organization anymore (Interview GHGE, October 11, 2018). GHGE is performing

the last mile by itself, but the representative can imagine a situation where a second UCC will be part of the logistics chain.

With respect to urban freight transport, the representative of TLN stated that “*collaboration is crucial*”. The organization acts in accordance by collaborating with energy suppliers, the RAI association, which serve the interests of manufacturers in the mobility sector, the national government, local governments and carriers (Interview TLN, September 27, 2018). Further, in multiple cities, both TLN and Evofenedex are part of an advisory board, together with public transport organizations, retailers and the municipality. The representative of TLN explains further that carriers and haulers collaborate with each other. The representative of Detailhandel Nederland explains to be only a little involved in urban freight transport. The organization, however, has a lobby towards the national government, collaborates with interest organizations, large companies and trade organizations (Interview Detailhandel Nederland, October 2, 2018). Concerning supermarkets, the representative of Detailhandel Nederland recognizes that these organizations either regulate their own logistics, or there is a strong collaboration between them and the haulers.

The representative of the municipality of Groningen explained that it collaborates with multiple parties, for example entrepreneurs, residents, carriers, ministries and other cities. This is proved by concluding a covenant with multiple local stakeholders. Emphasized by the interviewee is that these stakeholders have a share in determining the outcome of decisions concerning urban freight transport. Further, there are plans to collaborate more intense with other cities in the Northern Netherlands (Interview Municipality of Groningen, October 10). The representatives of both Detailhandel Nederland, Evofenedex and TLN note that their ideas are informed for governmental decision making, while the individual organizations Cycloon and GHGE indicate to not have a direct influence.

4.3.3 Regime powers

Chapters 2 and 4 give attention to the vehicle industry as a regime. The representative of TLN explains that the truck manufacturers produce for the European market. She argues that when it is clear to the vehicle industry what the restrictions on vehicles will be, they can respond to it. The interviewee emphasized that it is thinkable that if other nations give clearance concern the restrictions earlier, new productions may go to these nations first. The effect of (un)availability of emission free vehicles is already visible: GHGE wanted to invest in an electrical emission free vehicle, but postponed the investment because it turned out to be too expensive (Interview GHGE, October 11, 2018). The representative of the municipality of Groningen recognizes this problem: “*Logistic companies do not change to emission free transport vehicles because it is too expensive for them and the offer is limited*”. On trucks, too expensive is perceived as “*the ultimate prize*” (Interview GHGE, October 11, 2018) and is “*two and a half to three times as expensive as a conventional vehicle*” (Interview TLN, September 27, 2018). Despite the vehicle industry has a large influence by enabling vehicles by price and by amount, neither the representative of TLN, the municipality of Groningen nor GHGE have a reason to believe that the vehicle industry is stimulating ‘conventional’ (i.e. not emission free and not consolidated on city level) freight transport above more sustainable alternatives, let alone that this regime level actor obstructs it.

Furthermore on the conditions of regime powers, the representative of GHGE remembered words of the founder of the network Goederenhubs that describe that nowadays proverbially the door of the municipality is open for them, while this was hardly the case ten years ago. The representative of the municipality of Groningen itself explains to be (financially) supported by the European Union by participating in the Interreg project, in which other European cities take part as well.

4.3.4 The degree of public ownership

The owners of both the GHGE and Stadsdistributie Groningen are private parties. Moreover, the representatives of both GHGE and Stadsdistributie Groningen are entrepreneurs and explain to have hardly any experience in the field of urban freight transport or logistics. The municipality of Groningen has never had the intention to perform a UCC themselves (Interview Municipality of Groningen, October 10, 2018).

4.3.5 Additional conditions

The interviewees argue that other conditions are relevant as well. According to the representative of TLN, the charging infrastructure for freight transport for electric vehicles is not sufficient at this moment. In addition, this stakeholder stresses the importance of IT, for example, to “*link logistic transport movements of a city with schedules of logistic service providers*”. The representatives of Cycloon and GHGE recognize the importance IT as well, among others to provide locational insights to clients and to scan labels of different haulers and carriers. The representative of the municipality of Groningen argues that the impossibility of communication between digital platforms of organizations influences the potential of a UCC.

One of the key aspects of a UCC is that goods are consolidated. The representatives of TLN and Evofenedex see that haulers and carriers are bundling themselves already. Instead of reasoning from the perspective of the location of the final destination, these stakeholders bundle on the trip level.

Costs are seen as an important factor in the employment of a UCC. Both the representatives of Detailhandel Nederland and Cycloon indicate that the margins in retail are small. The representative of Evofenedex sees that among many entrepreneurs that take care of transport by themselves, the amount of the transport costs is not exactly known. For this group, it is hard to estimate whether making use of a UCC will be financially beneficial or not (Interview Evofenedex, October 4, 2018). Further, according to the representative of Evofenedex and reinforced by the representative of the municipality of Groningen, this group is prohibited by law to bring goods of others with them.

Referring to the possible impact of a UCC, an estimation of the amount of freight that is suitable to be consolidated in a UCC is asked for during the interviews. The representatives of Cycloon and TLN were informed about that 20% of the inner city logistics is executed for retailers or by professional goods transporters. Both interviewees recognize that the construction sector has a stake in urban logistics worth mentioning. The representative of Detailhandel Nederland adds that vehicles of this sector are often standing still for a long period. Further, conditioned goods (i.e. chilled and frozen goods) (Interview Evofenedex, October 4, 2018) and divergently sized goods (Interview Detailhandel Nederland, October 2) are considered challenging to supply from a UCC.

Both the representatives of Cycloon, Evofenedex and TLN argue that a location of a UCC nearby the emission free zone of a city is most convenient. The interviewed representatives of Cycloon and TLN explain further that the UCC should be accessible for all types of vehicles, in particular for large trucks. The representative of GHGH has another explanation for a convenient location and reasons that the location choice is dependent on: transport towards the UCC, transport from the UCC towards the retailers and the site of the UCC. In short, the argument of a cheaper location near the highway and haulers that will be unburdened from the busy city outweighed the use of short-range vehicles for last-mile transport (Interview GHGE, October 11).

5. Conclusion

The aim of this study is to provide insight into under what combinations of conditions urban consolidation centers (UCCs) can contribute to emission free urban freight transport. The results give insight into combinations of conditions that logically lead to successful UCCs in the city of Groningen and how these relate with its stakeholders' need, roles and resources. Global heating and the pressure of freight transport on local livability triggered the search for emission free urban freight transport solutions. UCCs are a promising concept because it enables efficient urban freight transport by means of active and emission free modes. The main research question which follows is:

Under what conditions can urban consolidation centers enable emission free urban freight transport in the city of Groningen from 2025 on?

This study is framed by transition theory and is delineated by urban freight transport insights. The current emission free transport practices are researched on the landscape, regime and niche level. This study furthermore sheds light on logical causal combinations of conditions of a successful UCC and how these relate to the needs, roles and resources of stakeholders of a UCC in the city of Groningen. All this, by answering the four sub-research questions and the main research question below. Subsequently, the results are put in a wider context, recommendations are discussed and research suggestions are described.

How can UCCs structurally have a role in emission free urban freight transport following insights of transition theory?

Transition theory scholars explain the multi-phase, multi-level and multi-actor characteristic of transitions. With the help of scholarly articles on urban freight transport and UCCs, one is able to place UCCs into phases and levels and to determine relevant actors. The subsequent conceptual model shows the importance of local policy plans and the attitude of the vehicle industry on a regime level, to continue the transition towards a landscape in which urban freight transport is emission free. In addition, interaction between both public and private niche level actors is needed whilst they are subject to the utilization of administrative capacities. Multiple conditions that enable UCCs to structurally have a role in urban freight transport are derived from the theory: actor interaction of both public and private parties, administrative capacities and regime powers.

What are emission free urban freight transport practices in Groningen on the landscape, regime and niche level?

Policy documents and academic and grey literature show that policies and goals give meaning to the changing western worldview on climate change and emissions. The Dutch national government decentralized responsibility on urban freight transport to municipalities and businesses. As well on a landscape level, the infrastructure in cities can be considered beneficial for bicycle transport. On the regime level, one can recognize the fulfillment of a condition in the sense that the municipality of Groningen enables or even ensures a transition towards emission free urban freight transport. The vehicle industry is perceived to be an important player, but is more or less neglected in research. This regime level actor should produce electric freight vehicles. Electric vehicles are hardly used in urban freight transport nowadays. Reasons for this are the limited availability (both in choice options and in stock levels), pricing and the progress in innovation. On a niche level, by usage of UCCs, interorganizational logistics networks may change. Physical internet and drones may have a promising role here. Relevant to the niche level as well, is that municipalities, the national government, haulers,

carriers, car manufacturers, research institutions and trade organizations committed themselves to emission free city centers.

Which combinations of administrative capacities, actor interaction, degree of public ownership and regime powers produce successful UCCs?

Twenty cases of UCCs have been analyzed for this sub-research question. Fifteen of them are successful; they contribute to emission reduction, enhance the livability in the urban area, and are still operational. The fuzzy set qualitative comparative analysis (QCA) shows neither sufficient nor necessary conditions. The complex solution shows three mutually non-exclusive combinations of conditions that logically produce successful UCCs. The first is administrative capacities and no regime powers. The second is administrative capacities and no degree of public ownership, and the third is actor interaction, no degree of public ownership and regime powers.

The solution proves the theory right on the importance of the condition of administrative capacities to achieve successful UCCs. However, the theory can be nuanced since the cases indicate that additional incentives, which are administrative capacities, are especially relevant. Governmental funding is relevant in only one of the two solution paths that cover administrative capacities. Moreover, in contrast to the expectation set by the theory, information provisioning and arena setting are not found present in either one of the cases. Therefore, the theory should emphasize the importance of additional incentives above the other three administrative capacities. The third path shows that actor interaction helps in producing successful UCCs. This indicates that there should be interaction between two or three actors and the UCC. In contrast to the complex solution, the parsimonious solution neglects the importance of actor interaction. Although evidence for the theory is present, it is not that strong considering both the complex and the parsimonious solution. Both a membership and a non-membership in regime powers, in terms of non-governmental funding, can produce successful UCCs. Furthermore, the QCA shows that interaction between public and private actors, in the shape of ownership of UCCs, does not lead to successful UCCs. More precisely, private ownership is beneficial in combination with either administrative capacities or with actor interaction and regime powers.

What are the needs, roles and resources of main stakeholders in using a UCC in Groningen?

Theory and other UCCs indicate that five stakeholders are involved in a UCC, namely: a UCC operator, haulers, carriers, shop owners and the local government. The interviewees shed their light on the conditions that enable emission free urban freight transport by means of UCCs. The interviews indicate that laws and regulations are an influential administrative capacity. On this condition, haulers and carriers explain to desire clear restrictions on vehicles in urban areas that are harmonized between cities. This should inform the vehicle industry what to produce for the Dutch market, which in turn enables haulers and carriers to invest in emission free vehicles. Emission free vehicles are relatively expensive. Nevertheless, no perceptions are found that regime level actors, such as the vehicle industry, obstruct emission free urban freight transport. Retailers are less concerned with urban freight transport, but will benefit from delivery outside time windows. The municipality of Groningen only provides clear restrictions from 2025 on, i.e. emission producing freight transport is not allowed in at least the current time window area by then. Additional incentives for emission free vehicles are widely considered needed, however, not one stakeholder is a big fan of subsidies. This result on the condition of administrative capacities is in line with the outcome of the QCA. Stakeholders prefer a situation in which emission free urban freight transport is economically beneficial. More than in most of the cases in the QCA, the stakeholders in Groningen are interacting with each other. Namely, knowledge is shared between UCCs; haulers', carriers' and retailers' representatives collaborate and leave their mark on strategic decision making, and; the municipality sets an arena for collaboration. Despite, there are delivery parties that resist collaboration with UCCs to control their service provisioning.

Main conclusion and generalization

Four conditions have been identified from the literature: interaction between actors, provisioning of administrative capacities by governments, the degree of public ownership and exercise of power by regimes. The sub-research questions unanimously show the importance of administrative capacities. In particular, additional incentives such as exemptions of time windows and use of bus lanes are relevant for the successfulness of UCCs. Governmental funding can be supportive as well, but is not desirable for stakeholders and not necessary according to the QCA outcome. Interaction between actors is already largely present in Groningen. This condition has a cautious role in producing successful UCCs. In contrast to the set expectation, stakeholders are not skeptical about UCCs. This, with the note that consolidation should not increase the transport costs. The QCA showed the importance of lacking a degree of public ownership. Here, the theory can be nuanced; public ownership of UCCs is not an appropriate manner to reach public-private collaboration. The private ownership possibilities are reinforced by the fact that interviewed owners of UCCs all are private parties. Despite regime level actors enable upscaling of UCCs from the niche level to the regime level, its effect on the successfulness of UCCs is not consistently positive. Still, the theory is right about the idea that the regime level actors are key to pull UCC practices into the acceleration phase. Not by providing funds, but by harmonizing regulation through cities that are streamlined with both municipalities and the vehicle industry. Besides, regime level actors have to enable implementation of charging infrastructure and affordable emission free transport vehicles. Furthermore, innovation in IT should take place to enable communication between platforms of organizations or between packages themselves. Lacking performance of these actions can induce muddling through UCC practices that will be overtaken by alternatives. Moreover, it can induce not being able to organize satisfactory urban freight transport at all, due to area restrictions in combination with a lack of usage of emission free transport vehicles.

As explained above, the results of this study can make theories more precise. In general however, the used theories can be considered valid and useful. Especially, when referring to the theoretical perception that regimes in the early stages normally inhibits deviations of the status quo, such as UCCs, while it later can have an enabling role by upscaling the niche level innovations to the organizational power of the regime level, and slowly to the belief systems of the landscape level. Moreover, conform the theory, regime level organizations indeed have a decisive inhibiting or enabling role, and multiple actors are involved and have different objectives. Also, there is interaction between public and private parties, while the planning authority restrains other actors, and administrative capacities do spur upscaling of UCCs from the niche to the regime level.

The results are applicable to other cities in the Netherlands that strive for emission free inner city transport. Outside the Netherlands, performing the same study could lead to other results. Firstly, because governmental structures and tasks are different. Secondly, because a city structure, in which shops are mostly located in the city center and are largely accessible by bicycles, cannot always be found in other nations.

Recommendations for the municipality of Groningen

The Dutch traffic and transport sector is for 20 percent responsible for CO₂ emission. Therefore, there is a significant opportunity for emission reduction. By enabling emission free freight transport and reducing the amount of vehicles trips in urban areas, UCCs can provoke CO₂ emission diminishing. There is a role for the municipality to enable successful UCCs. National operating stakeholders turn out to be substantiated skeptical about the lack of harmonized regulation between cities. Since the national government decentralized responsibilities to lower government, there is a role for the municipality of Groningen to collaborate with other municipalities. They have to draw one line in restrictions of urban zones that are beneficial for emission free freight transport. Furthermore, the municipality of Groningen has to provide clear restrictions for both the short and the long term. These restrictions have to inform and guide stakeholders today, to enable the stakeholders to plan and invest in accordance. This means

that the municipal policy has to be harmonized and has to be clear on the allowed vehicle types in specified zones from a set date on. The Environmental law (Omgevingswet) can possibly be an entry here. Considering current policy perhaps superfluously, but enforcement of regulation is necessary.

Furthermore, the municipality of Groningen should focus on the condition of administrative capacities. It is recommended to preserve and expand the additional incentives for emission free urban freight transport. The arena setting activities are appreciated by the stakeholders. Despite subsidies turns out to be beneficial in other cases, there is no need for subsidy provision. Therefore, finances should be spent on the additional incentives and enforcement of the regulations. In line with the intention of the municipality of Groningen, the municipality should not be part of the ownership of UCCs.

At last, it is recommended to monitor initiatives and the situation in the urban area. Besides monitoring pilots themselves, it is interesting to examine what their effect is on the whole system. When being aware of the amount of freight transport pollution and congestion in the current situation, one can measure whether a UCC is beneficial from 2025 on. Besides, UCCs proved to enable active and emission free modes. Therefore, the current streetscape will change, which probably will have more implications than enhanced livability solely. An example is that it is imaginable that UCCs contribute to the awareness and the mindset of people who live in and visit urban areas: one can experience the possibilities of transport without emitting CO₂. Furthermore, freight transport with small electric vehicles and bicycles in contrast to regular trucks, are considered to enhance the inner city livability. It is imaginable that the impact of whole day deliveries by electric vehicles will change people's perception towards livability. Despite noise reduction is continuous and safety is enhanced, a recent study shows that caterers and shopkeepers in Groningen suffer from the frequency of visits of carrier organizations (Annema, 2018). Additionally, the safety of other road users will possibly be endangered by electric freight vehicles and Dutch regulations and infrastructure are not prepared for such vehicles (Amstel et al., 2018 and Koolstra et al, 2017).

Further research

Further research on the effect of UCCs can determine the extent to which UCCs are beneficial in reaching sustainability goals, in reaching the desired livability and on the impact of stakeholders' and consumers' attitudes. Further research on the supply chain management level is relevant as well in order to maximize UCCs its efficiency. Also, UCCs for other sectors, such as the constructing sector, may be beneficial to make use of in urban freight transport. It would be interesting to examine if such UCCs can diminish emission reduction and enhance the livability and if the same conditions apply for successful UCCs in that sector.

6. Reflection

This chapter gives a general academic reflection. To start, more information could be retrieved by interviewing all stakeholders themselves, instead of representative organizations. In this study, chosen is to examine the whole image of how to upscale UCCs from the niche to the regime level, above more specific information. Therefore, it is regrettable that a representative of the Groningen City Club could not be interviewed. The Groningen City Club is an entrepreneurial association which represents organizations from almost all branches and strives for a pleasant inner city (Groningen City Club, 2018). Therefore, it would have been an interesting party to verify quotations of Detailhandel Nederland and explore to what extent national urban freight transport issues, related with UCCs, are true for the city of Groningen. An interview with this stakeholder is however not decisive in this study since Detailhandel Nederland covers the interests of entrepreneurs in Groningen as well. Further, it is arguable that distribution centers and wholesalers have a stake in upscaling UCCs. Since literature and the case studies did not give reason to, these parties are not considered as a stakeholder.

As section 3.4.2 touches upon, there are multiple advantages and disadvantages of the QCA method. In QCA, the amount of conditions is important and is both an advantage and a disadvantage. By bringing back the number of conditions, fewer configurations are possible, and thereby stronger conclusions can be drawn: multiple cases endorse the same combination of conditions. The other side is, that information is lost. For example, the condition actor interaction now tells something about the number of stakeholders involved. When this condition is split in a single condition for each stakeholder, the researcher would be able to conclude which combination of stakeholders have an urgent role in the successfulness of UCCs. This trade-off is described by Gerrits and Verweij (2018) as: “*the more conditions you study, [...], the less in-depth knowledge you have*”.

Further, the performance of the QCA depends on the availability of information. Some information on cases is dated and multiple case evaluations do not cover the required information and therefore are not part of the analysis. Also, regime powers were often not discussed clearly, if there was information about in the first place. Therefore, regime powers in the QCA is about funding only. The same is true for arena setting as an administrative capacity; arena setting probably is happening in some cases, but this did not become clear from the literature. At last, misinterpretation of a situation could have occurred by the authors of the literature and misinterpretation of text could have occurred by acknowledging the literature for this study. Despite a structural search and interpretation strategy is performed, misinterpretation cannot be excluded fully.

Despite the methodological constraints, the use of multiple methods ensures a convincing outcome. The variety of literature, an appreciated theory, twenty cases and interviews with all stakeholder groups, the transition of UCCs is examined from different angles and bottlenecks became clear. The practical implications can assist in the role of UCCs in the transition towards emission free urban freight transport.

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Appendices

- I. QCA Calibration
- II. QCA stepwise
- III. Interview protocols

I. QCA Calibration

In the Table I is explained whether a 0 (fully out), 0.33, 0.67 or 1 (fully in) is assigned to each condition. As the conditions itself are identified from the literature, the positive effect of each condition is determined with help of the literature as well. The higher the degree of membership, logically, the more positive the contribution of a condition to the outcome.

Table I: Calibration of conditions

Condition	0 (In, Non-membership)	0.33 (More out than in)	0.67 (More in than out)	1 (Out, Membership)
Administrative capacities	No additional incentives or funding by the municipality, city, region or national government stimulate the usage or existence of the UCC.	The municipality, city, region or national government provides monetary subsidies for the arrangement and/or performance of the UCC, but no additional incentives such as exemptions for time windows, environmental zones or bus lanes are provided (not applicable).	The UCC and/or its users are benefitting from additional incentives such as exemptions for time windows, environmental zones or bus lanes, but no municipality, city, region or national governmental funding is provided.	The UCC and/or its users are benefitting from additional incentives and the municipality, city, region or national government provides monetary subsidies for the arrangement and/or performance of the UCC.
Actor interaction	No other stakeholder than the owner is involved.	Either (a) hauler(s), (a) carrier(s) or (a) receiver(s) is/are involved.	Two of the following stakeholders are involved: (a) hauler(s), (a) carrier(s) or (a) receiver(s).	Both (a) hauler(s), (a) carrier(s) and (a) receiver(s) are involved.
Degree of public ownership	Owner is a private party or an organization of private parties.	Owner started as a public organization, but is continued by a private	Owner is a cooperation or partnership between, or an organization	Owner is a public party.

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		party, or; the owner is a private organization in which a public party has a stake.	consisting of, a public and private party or parties.	
Regime powers	There are no non-governmental funds provided.	Not applicable.	Not applicable.	Non-governmental financial support is granted.
Successful	The UCC does not have a positive contribution to the urban area it serves or does not contribute to emission reduction in this area or is not operational anymore.	Not applicable.	Not applicable.	The UCC has a positive contribution to the urban area it serves, contributes to emission reduction in this area and is operational at the moment of analysis.

Table II shows a concise description per condition for each case.

Table II: Information about conditions per case

Case	Continuity	Owner UCC	Funding	Involved parties	Additional incentives	Emission reduction	Livability enhancement	Successful
AmsterdamA (Cargohopper)	2014 – now	Private (Transmission)	Municipality	Shippers (no extra costs are applicable) and retailers, owner is logistics operator (carrier)	Not dependent on environmental zones	Electric vehicles (emission free)	Safe, clean, quiet, public friendly	Yes
AmsterdamB (University)	2017 – now	University of Amsterdam	-	Eight largest suppliers of the University and School for higher education of Amsterdam; UvA, HvA and others	The electric vehicles are not dependent on time windows	Use of electric vehicles	Less trucks	Yes
Brescia (Eco-Logis)	2012 – now	Public-Private partnership (Partnership City of Brescia and private parties)	City: €150.000 Region: €50.000	Forwarders, logistics operators and shops	Low traffic zone does not apply for Eco-Logis vehicles	Avoided 21,42 tons CO ₂ and 4094 gram PM ₁₀ (2017)	16.000 km driven by electric vehicles	Yes
Bristol (also covers Bath since 2011)	2002 – Now	Private	City (and EU) (structural, 62%)	Retailers, scheme operator, DfT officials, FTA, freight sector representatives, Local Politicians, Local Authorities and academic/Research Institutions	Priority lane for consolidation vehicles combined with access restrictions and delivery time windows	Electric vehicles. Reduction of 20.3 ton of CO ₂ , 660 kg of NO _x and 19.7 kg of PM ₁₀ in 2010. (5% reduction vehicle movements, 6,945 fewer trips, saving of 178,000 vehicle kilometres)	Less noise and air pollution	Yes
City Depot BE (nine cities in Belgium)	2011 – Now	Private	Yes, initially 50%, since half 2014	Haulers, carriers, retailers, consumers, municipality	No	Use of electric vehicles (also trucks)	Less noise and air pollution	Yes, UCC in Brugge stopped due

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			financially self-reliant					lack of clients in the city center
City Hub (Amsterdam, The Hague, Rotterdam, Roermond, Utrecht)	2015 – Now	Private (City hub x 2Dok) (Franchise)	No subsidies, crowdfunding	Haulers	Electric vehicles are not dependent on low emission zones	Consolidated transport	Consolidated transport	Yes
Copenhagen (Citylogistik-Kbh)	2012 – now	Private	Financially supported by Øresund Ecomobility as well as Danish Transport Authority	Logistics operator, involved actors are universities and Danish transport authority	Not dependent on time windows	Use of electric vehicles	Increase the quality of urban living by environmental and social benefits	
Deventer (Stadsdistributie)	2011 – Now	Private (Medium and small business (MKB) Deventer and Sallcon Werkbedrijf)	Not directly (semi-governmental organization involved)	Cooperation with SITA for picking glass garbage and retailers are involved. Possibility for on demand supply for retailers.	Not dependent on time windows.	Transport with electric vehicles	Less trucks	Yes
Gothenburg (Stadsleveransen)	2012 – now	Private (company owned by retailers, real estate owners and the city)	The local authority, trade Association, transport companies, advertisement and a property owner, Hauler company	Shops, logistics operator, transport companies	Multiple.	Consolidated transport	Truck free inner city	Yes
Green City Distribution	2009 – 2016	Private	-	Haulers (could bring goods between 6.30 and 7.30 hours) and receivers	-	Natural gas powered vehicles	Less trucks (due consolidation)	No

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(multiple Dutch cities)								
Utrecht (Cargohopper)	2009 – 2014	Private (Transmission)	Provincial (for research) and municipal (in concept phase)	Shippers (no extra costs are applicable) and retailers, owner is logistics operator (carrier)	Not dependent on environmental zones, exemptions for bus lanes and time windows	Electric vehicles (emission free) (18.400 kilo CO2 reduction in first year)	Safe, clean, quiet, public friendly	No, not financially viable. Disagreement about use of subsidies/funds.
La Rochelle	2001 – Now	First public (Community of agglomeration of La Rochelle), since 2006 private (attained via competitive tender)	Local government for infrastructure and an amount per package	Shared sense of urgency among stakeholders, of which retailers external carriers and haulers are part.	Time windows, access forbidden for trucks >3.5 ton except for 1.5 hours a day. Provisioning of additional services to spread fixed costs over multiple products Lacking enforcement (Quak, 2008)	Use of electric vehicles, 61% less vehicle kilometers with conventional trucks in the city center	Less trucks in city center	Not financially viable
Leiden	1997 – 2000	Public, Municipality	Municipal	Hauler, carriers (except for those who met requirements)	Not dependent on time windows, considered unfair	Use of electric vehicles (25 km/u)	Slow electric vehicles hindered traffic	No
Malaga	2004 – Now	PPP, Municipality /transport federation of Malaga and transport organization (CUDE)	Public	Transport x municipality	Evening time window for trucks is removed, morning time window and pedestrian zone are not applicable for UCC using vehicles	Use of electric trucks/ 'ecofriendly vehicles'	CO2 reduction of 3.75 ton/year, use of electric vehicles	Yes, (after three years financially break-even)
Milan (Cityplus)	2005 – 2008 (experiment)	Public company responsible for public transport	Funded by the European Union, municipality, region, state government	Public transport organization	Access to reserved lanes	Use of low emission vans (euro 4)	Consolidated transport	No, Road haulers Associations accuse Cityplus of infringing job hiring regulations,

Emission free urban freight transport by means of urban consolidation centers

								sensitive for management frictions (political appointments), Incomplete liberalisation of access to road transport market prevents a LPT company from becoming a freight transport company
Nijmegen (Binnenstadsservice)	2008 – now	Private (active in eight cities)	1 year, to find stores to join / €100.000 from municipality	Focus on receivers (stores) above carriers. First self the carrier, now outsources to third party	Not dependent on time windows.	Use of electric vehicles and natural gas trucks, 5% reduction of truck kilometer, leading to a CO ₂ reduction of 50kgs per week	However small, less pollutant emission, lower noise level on ring road	Yes
Padua (Cityporto)	2004 – now (gradual implementation)	Public private partnership (Municipality, Province, Chamber of Commerce)	Municipally, three years. Financially self-sustainable since 2012	Haulers, transport operators (55 parties)	Yes, No time limitations for (un)loading Cityporto vehicles, and availability of bus lanes. Additional services and IT management	CNG and hybrid powered vehicles. Avoided 219 tons CO ₂ , 369 kg NO _x , 72 Kg SO _x , 210 kg VOC, and 51 kg PM ₁₀ between July 2008 and June 2010	Congestion reduction, not emission free	Yes
ParisA (Distripolis)	2011 – now (three step implementation)	Private (three subsidiaries of one organization)	No	Haulers, owner is carrier	Yes, exemption for demi-pedestrian zones and the traffic restriction of one hour in the city center	Use of electric vehicles	5% km reduction, electric vehicles	Yes

Emission free urban freight transport by means of urban consolidation centers

ParisB (The Green Link)	2009 – now	Private	-	Have their own fleet in addition of TNT carriers. Cooperate with receivers and haulers.	Plead for municipal help for location availability	Avoided 400 tons CO2 (2014)		Yes
San Sebastian	2010 – now	Public (municipal UCC, private transport)	EVE, CIVITAS	Involved actors are City council, research institutes and private companies	Not dependent on time windows	Use of electric vehicles (cargo bikes)	Less trucks, less noise and air pollution.	Yes

Merging both Table I and Table II, an input for performing a QCA can be created. This means, that the results of the case study evaluation analysis (Table II) are piece by piece compared with the degree of membership per condition (Table I). The data input of Table II results in a degree of membership, structured by Table I. This process of calibration results in the calibrated data matrix, see Table III. Table III shows whether a case fulfils a condition with 0, 0.33, 0.67 and 1 as degree of membership. For example, AmsterdamA is operational at this moment, performs the last mile with zero emission vehicles and diminishes the air and noise pollution and unsafe situations. This results in a 1 for successful. Further, the UCC is financially supported by the municipality and benefits from exemption of time windows. Therefore, also for administrative capacities a 1 is assigned. The membership that belongs to the condition actor interaction is 0.67, namely, Table II shows that two actor groups (shippers and retailers) are involved in the UCC. A private party is the owner of the UCC, which indicates that a 0 is assigned to the degree of public ownership. Table III is the input for the QCA software fscqa. Appendix II describes the further analysis in the program step-by-step.

Table III: Calibrated data matrix

Case	Conditions				Outcome
	Administrative capacities	Actor interaction	Degree of public ownership	Regime powers	Successful
AmsterdamA	1	0.67	0	1	1
AmsterdamB	0.67	1	0	0	1
Brescia	1	1	0.67	1	1
Bristol	1	1	0	1	1
City Depot	0.33	1	0	1	1
City Hub	0.67	0.33	0	0	1
Copenhagen	1	0.33	0	1	1
Deventer	0.67	0.33	0	0	1
Gothenburg	1	1	0.33	1	1
Green City Distribution	0	0.67	0	0	0
La Rochelle	1	1	0.33	1	1
Leiden	1	0.67	1	1	0
Malaga	0.67	0.33	0.67	0	1
Milan	1	0.33	1	1	0
Nijmegen	1	0.67	0	1	1
Padua	1	0.67	0.67	1	1
ParisA	0.67	0.33	0	0	1
ParisB	0.67	1	0	0	1
San Sebastian	0.67	1	1	0	1
Utrecht	1	0.67	0	1	0

II. QCA stepwise

This appendix explains the steps taken in fs/QCA and takes Table III, in .csv format, as starting point. First, Table 7 in section 4.2.1 shows the truth table. In this Table, one can see that fifteen of the twenty cases successful and have a consistency of $> .8$. This strives with the suggestion of Ragin (2017), moreover, here is a consistency gap of .087001. A cut-off at the first larger gap, would result in accepting cases with a consistency of .666667.

In the next sections, respectively described is how the necessity and the complex and parsimonious solution are determined and retrieved with the program fs/QCA.

II.I Necessity

Neither administrative capacities, actor interaction nor regime powers are necessity. As one can see below, no condition pass the necessity threshold of a consistency of 0.9.

Analyze> Necessary conditions> Outcome = Successful, Conditions = Administrative Capacities

Consistency = 0.813750

Coverage = 0.812734

Analyze> Necessary conditions> Outcome = Successful, Conditions = Actor Interaction

Consistency = 0.728750

Coverage = 0.832857

Analyze> Necessary conditions> Outcome = Successful, Conditions = Regime Powers

Consistency = 0.562500

Coverage = 0.750000

II.II Solution

As described in chapter 3.4.4, both the complex solution and the most parsimonious solution is retrieved with the software. First, the way to arrive at the complex solution is described, followed by the complex solution (Table IV). Thereafter, the steps towards the parsimonious solution and the parsimonious solution itself is shown (Table V).

Complex solution

Analyze> Truth Table Algorithm> Outcome = Successful, Causal conditions = Administrative Capacities + Actor Interaction + Degree of Public Ownership + Regime Powers, check box 'Show solution cases in output' > Sort raw consist. from high to low > select first case without a raw consistency > Edit > Delete current row to last row > fill in '1' for successful at raw consistencies higher than .8 (.834 and higher, seven combinations) > fill in '0' for successful at raw consistencies lower than .8 (0.74717 and lower, 3 combinations)> Specify analysis, keep settings (Positive cases = True, rest = False) > OK/cancel > Standard analysis > Keep settings (Present or Absent is checked for each condition) > OK.

Table IV: Complex solution, retrieved from fs/QCA (Ragin, Davey & Drass, 2017)

Path	Cases (membership >.5)	Raw coverage	Unique coverage	Consistency
Administrative Capacities * ~Regime Powers	AmsterdamB, City Hub, Deventer, Malaga, ParisA, ParisB & San Sebastian	0.293125	0.063125	1
Administrative Capacities * ~Degree Of Public Ownership	AmsterdamA, Bristol, Copenhagen, Nijmegen, Utrecht, AmsterdamB, City Hub, Deventer, ParisA, ParisB, Gothenburg & La Rochelle	0.625625	0.083125	0.909173
Actor Interaction * ~Degree Of Public Ownership * Regime Powers	Bristol, City Depot BE, AmsterdamA, Nijmegen, Utrecht, Gothenburg & La Rochelle	0.354375	0.041875	0.894322
Solution coverage: 0.730625 Solution consistency: 0.921198				

Parsimonious solution

Next to the complex solution, the parsimonious solution is elaborated upon. Again, first the steps taken in fs/QCA towards the solution are described, followed by the solution itself (Table V).

Analyze> Truth Table Algorithm> Outcome = Successful, Causal conditions = Administrative Capacities + Actor Interaction + Degree of Public Ownership + Regime Powers, check box 'Show solution cases in output' > Sort raw consist. from high to low > select first case without a raw consistency > Edit > Delete current row to last row > fill in '1' for successful at raw consistencies higher than .8 (.834 and higher, seven combinations) > fill in '0' for successful at raw consistencies lower than .8 (0.74717 and lower, 3 combinations)> Specify analysis, change settings (Positive cases = True, Negative cases = False and Remainders = Don't Cares (Ragin, 2017)) > OK/cancel > Standard analysis > Keep settings (Present or Absent is checked for each condition) > OK.

Table V: Parsimonious solution, retrieved from fs/QCA (Ragin, Davey & Drass, 2017)

Path	Cases (membership >.5)	Raw coverage	Unique coverage	Consistency
Administrative Capacities * ~Regime Powers	AmsterdamB, City Hub, Deventer, Malaga, ParisA, ParisB & San Sebastian	0.293125	0.293125	1
~Degree Of Public Ownership * Regime Powers	AmsterdamA, Bristol, City Depot BE, Copenhagen, Nijmegen, Utrecht, Gothenburg & La Rochelle	0.4375	0.4375	0.875
Solution coverage: 0.730625 Solution consistency: 0.921198				

III. Interview protocols

III.I Cycloon

1. Wat is volgens u de functie van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributiecentrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport/goederenvervoer in Groningen?
3. Wordt de manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd?
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
4. Wordt de manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd?
 - 4a. Zo ja, door wie en/of wat?
 - 4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd, zoals fietskoeriersdiensten?
 - 5a. Zo ja, hoe?
6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd, zoals fietskoeriersdiensten?
 - 6a. Zo ja, hoe?
7. Ontvangt u momenteel subsidies met betrekking tot (stedelijk) emissiearm vrachttransport?
 - 7a. Indien ja, van wie? (overheden?)
8. Wordt u door een instantie bijgestaan met kennis over emissie van binnenstedelijk transport?
 - 8a. Indien ja, door welke instantie?
 - 8b. Met welke informatie?
9. Hebben wetten en regels invloed op uw huidige manier van binnenstedelijke distributie?
 - 9a. Indien ja, positief of negatief?
 - 9b. Indien ja, kunt u een voorbeeld geven?
10. Deelt u kennis, informatie of vergelijkbaar/werkt u samen met betrokkenen van stedelijke distributie, zoals leveranciers, verladers of klanten?
 - 10a. Indien ja, met welke partijen?
 - 10b. Op welke manier?

11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)
12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			
Anders			

13. Hoe kijkt u naar het delen van opslagruimte en middelen met andere partijen?
14. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer?
15. Beoogd wordt dat in 2025 in Groningen geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van Groningen komen.
- 15a. Was u hiermee bekend?
- 15b. Wat vindt u van deze beslissing?
- 15c. Welke gevolgen voorziet u voor uw organisatie hierdoor?
- 15d. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
- 15e. Hebt u hier middelen of kennis voor nodig die u niet heeft?
16. Verwacht u dat uw transportkosten hoger zijn dan die van vervoerders die geen gebruik maken van een stedelijk overslagpunt?
- 16a. Welk percentage/ bedrag per levering?
17. Hoe denkt u over om de 'last mile' voor andere vervoerders uit te voeren?
18. Ziet u potentie in een gedeeld stedelijk distributiecentrum?
- 18a. Zijn er productsoorten die u momenteel niet kunt vervoeren?
19. Zou u gebruik willen maken van een gedeeld stedelijk distributiecentrum?
- 19a. Waarom wel/niet?
- 19b. Heeft u randvoorwaarden waaraan dit centrum aan kan voldoen (bijvoorbeeld: service, locatie, eigen/extern beheer) (Wanneer zou u er wel gebruik van maken?)
- 19c. Ziet u belemmeringen voor het gebruik van een stedelijk distributie centrum voor uw organisatie?
20. Ziet u een rol voor uw organisatie in de totstandkoming van en/of bij het functioneren van een gedeeld stedelijk distributiecentrum?
- 20a. Indien ja, welke?

III.II Detailhandel Nederland

1. Wat is volgens u de functie van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributie centrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport?

2a. En in Groningen specifiek?

3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd? (Positief beïnvloed door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)

3a. Zo ja, door wie en/of wat?

3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport

4. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd? (door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)

4a. Zo ja, door wie en/of wat?

4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport

5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?

5a. Zo ja, hoe?

6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?

6a. Zo ja, hoe?

7. Ontvangt u(w branche) momenteel subsidies met betrekking tot emissiearm stedelijk vrachttransport?

7a. Indien ja, van wie?

8. Wordt u(w branche) door een instantie bijgestaan met kennis over emissiearm stedelijk vrachttransport?

8a. Indien ja, door welke instantie?

8b. Met welke informatie?

9. Hebben wetten en regels invloed op uw huidige manier van goederenontvangst door winkeliers?

9a. Indien ja, positief of negatief?

9b. Indien ja, kunt u een voorbeeld geven?

10. Deelt u kennis, informatie of vergelijkbaar/werkt u samen met betrokkenen van stedelijke distributie, zoals leveranciers, verladers of klanten?

10a. Indien ja, met welke partijen?

10b. Op welke manier?

11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)

12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			

13. Hoe kijkt u(w branche) naar het delen van opslagruimte en middelen met andere partijen?
14. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer? (Routes, Hubs, venstertijden)
14a. Geldt dit tevens voor de winkeliers zelf?
15. Beoogd wordt dat in 2025 geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van Groningen komen.
15a. Was u hiermee bekend?
15b. Wat vindt u van deze beslissing?
15c. Welke gevolgen voorziet u voor winkeliers in de binnenstad?
15d. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
15e. Hebt u hier middelen of kennis voor nodig die u niet heeft?
16. Zou u een stijging van uw leverkosten (transport kosten) overhebben voor een bijdrage aan een emissievrije binnenstad?
16a. Welk percentage/ bedrag per levering?
17. Hoe denkt u over om de 'last mile' door een derde partij uit te laten voeren (met als doel dat de binnenstad emissievrij en leefbaarder wordt)?
18. Ziet u potentie in een stedelijk distributie centrum?
18a. Kunt u een inschatting maken hoeveel procent van de vracht geschikt is voor gebruik van een stedelijk distributie centrum?
19. Zou u gebruik willen maken van een gedeeld stedelijk distributie centrum?
19a. Waarom wel/niet?
19b. Heeft u randvoorwaarden waaraan dit centrum aan kan voldoen (bijvoorbeeld: service, locatie, eigen/extern beheer) (Wanneer zou u er wel gebruik van maken?)
19c. Ziet u belemmeringen voor het gebruik van een stedelijk distributie centrum voor uw winkeliers?
19d. Maakt het voor winkeliers uit welke partij bezorgt (stedelijk distributie centrum/vervoerder)?
20. Ziet u een rol voor uw organisatie in de totstandkoming van en/of bij het functioneren van een stedelijk distributie centrum?
20a. Indien ja, welke?

III.III Evofenedex

1. Wat is volgens u de beschrijving van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributie centrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport?
 - 2a. En in Groningen specifiek?
3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd? (Positief beïnvloed door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
4. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd? (door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 4a. Zo ja, door wie en/of wat?
 - 4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?
 - 5a. Zo ja, hoe?
6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?
 - 6a. Zo ja, hoe?
7. Ontvangt u(w branche) momenteel subsidies met betrekking tot emissiearm stedelijk vrachttransport?
 - 7a. Indien ja, van wie?
8. Wordt u(w branche) door een instantie bijgestaan met kennis over emissiearm stedelijk vrachttransport?
 - 8a. Indien ja, door welke instantie?
 - 8b. Met welke informatie?
9. Hebben wetten en regels invloed op de huidige manier van stedelijke distributie door transporteurs?
 - 9a. Indien ja, positief of negatief?
 - 9b. Indien ja, kunt u een voorbeeld geven?
10. Deelt u kennis, informatie of vergelijkbaar met betrokkenen van stedelijke distributie, zoals leveranciers, distributiecentra of klanten?
 - 10a. Indien ja, met welke partijen?
 - 10b. Op welke manier?

11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)
12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			

13. Hoe kijkt u(w branche) naar het delen van opslagruimte en middelen met andere partijen (concurrenten)?
14. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer? (Routes, Hubs, venstertijden)
15. Beoogd wordt dat in 2025 geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van onder andere Groningen komen.
- 15a. Was u hiermee bekend?
- 15b. Wat vindt u van deze beslissing?
- 15c. Welke gevolgen voorziet u voor transporteurs hierdoor?
- 15d. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
- 15e. Hebt u hier middelen of kennis voor nodig die u niet heeft?
16. Zou u(w branche) een stijging van uw transportkosten over hebben voor een bijdrage aan een emissievrije binnenstad?
- 16a. Welk percentage/ bedrag per levering?
17. Hoe denkt u over om de 'last mile' door een derde partij uit te laten voeren (met als doel dat de binnenstad emissievrij en leefbaarder wordt)?
18. Ziet u potentie in een stedelijk distributie centrum?
- 18a. Kunt u een inschatting maken hoeveel procent van de vracht geschikt is voor gebruik van een stedelijk distributie centrum?
19. Zou u gebruik willen maken van een gedeeld stedelijk distributie centrum?
- 19a. Waarom wel/niet?
- 19b. Heeft u randvoorwaarden waaraan dit centrum aan kan voldoen (bijvoorbeeld: service, locatie, eigen/extern beheer) (Wanneer zou u er wel gebruik van maken?)
- 19c. Ziet u belemmeringen voor het gebruik van een stedelijk distributie centrum voor uw organisatie?
20. Ziet u een rol voor uw organisatie in de totstandkoming van en/of bij het functioneren van een stedelijk distributie centrum?
- 20a. Indien ja, welke?

III.IV Goederenhub Groningen-Eelde (GHGE)

1. Wat is volgens u de functie van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributie centrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport/goederenvervoer in Groningen? (wie doet de last mile?)
3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd? (Positief beïnvloed door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport?
4. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd? (door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 4a. Zo ja, door wie en/of wat?
 - 4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport?
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?
 - 5a. Zo ja, hoe?
6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?
 - 6a. Zo ja, hoe?
7. Ontvangt u momenteel subsidies met betrekking tot (stedelijk) emissiearm vrachttransport?
 - 7a. Indien ja, van wie?
8. Wordt u door een instantie bijgestaan met kennis over emissie van binnenstedelijk transport?
 - 8a. Indien ja, door welke instantie?
 - 8b. Met welke informatie?
9. Hebben wetten en regels invloed op uw huidige manier van stedelijke distributie?
 - 9a. Indien ja, positief of negatief?
 - 9b. Indien ja, kunt u een voorbeeld geven?
10. Deelt u kennis, informatie of vergelijkbaar/werkt u samen met betrokkenen van stedelijke distributie, zoals leveranciers, verladers of klanten?
 - 10a. Indien ja, met welke partijen?
 - 10b. Op welke manier?

11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)
12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			
Anders			

13. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer? (Routes, Hubs, venstertijden)
14. Beoogd wordt dat in 2025 in Groningen geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van Groningen komen.
- 14a. Wat vindt u van deze beslissing?
- 14b. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
- 14c. Hebt u hier middelen of kennis voor nodig die u niet heeft?
15. Verwacht u een stijging van transportkosten in de keten door gebruik van een extra overslagpunt?
- 15a. Welk percentage/ bedrag per levering?
16. Biedt u service op maat aan verladers of retailers?
17. Assen, Groningen en de regio zijn het verzorgingsgebied van de Goederenhub Groningen Eelde. Welke afwegingen heeft u gemaakt voor de locatiekeuze?
18. Er zijn verschillende voorbeelden van hubs die het slechts enkele jaren uithouden. Hoe gaat GHGE het beter doen?
19. Zijn er goederen (bijvoorbeeld hangende kleding, gekoelde of waardevolle producten) die niet geconsolideerd kunnen worden in deze hub?

III.V Municipality of Groningen

1. Kunt u uw rol of plek in de binnenstedelijke vrachttransport/goederenvervoer in Groningen beschrijven?
2. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd?
 - 2a. Zo ja, door wie en/of wat?
 - 2b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd?
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
4. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?
 - 4a. Zo ja, hoe?
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?
 - 5a. Zo ja, hoe?
6. Verleent u momenteel subsidies met betrekking tot (stedelijk) emissiearm vrachttransport?
 - 6a. Indien ja, aan wie? Voor wat?
7. Verleent u kennis over emissievrije binnenstedelijke distributie?
 - 7a. Indien ja, welke informatie op welke wijze?
8. Wordt u door een andere instantie bijgestaan met kennis over emissievrije binnenstedelijke distributie?
 - 8a. Indien ja, welke informatie van welke partij?
9. Deelt u kennis, informatie of vergelijkbaar/werkt u samen met betrokkenen van stedelijke distributie, zoals leveranciers, verladers of klanten?
 - 9a. Indien ja, met welke partijen?
 - 9b. Op welke manier?

10. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)
11. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Andere gemeenten			
Anders			

12. Heeft u andere partijen in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer?
12a. Op welke manier?
13. Zullen partijen, indien binnenstedelijk transport duurder wordt doordat emissievrij transport in de binnenstad in 2025 een vereiste is, bijgestaan worden?
13a. Op welke manier?
13b. In het concept Convenant Duurzame Stadslogistiek Groningen wordt verwezen naar privileges voor zero-emissie voertuigen. Wat betekent dit in de praktijk?
14. Is reeds bekend wat exact de contouren van het emissievrije gebied zullen zijn?
15. Zijn er ambities om de emissievrije zone uit te breiden naar andere delen van de stad?
15a. Waarom wel/niet?
16. Het Ministerie van Infrastructuur en Waterstaat heeft uitgesproken milieuzones te harmoniseren. De restricties verhogen trapsgewijs.
17. Ziet u een rol voor uw organisatie in de totstandkoming van en/of bij het functioneren van een stedelijk distributie centrum?
17a. Indien ja, welke?
17b. Heeft u randvoorwaarden waaraan dit centrum aan kan voldoen (bijvoorbeeld: service, locatie, beheer)?

III.VI Stadsdistributie Groningen

1. Wat is volgens u de functie van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributie centrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport/goederenvervoer in Groningen?
3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd? (Positief beïnvloed door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport?
4. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd? (door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 4a. Zo ja, door wie en/of wat?
 - 4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport?
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?
 - 5a. Zo ja, hoe?
6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?
 - 6a. Zo ja, hoe?
7. Ontvangt u momenteel subsidies met betrekking tot (stedelijk) emissiearm vrachttransport?
 - 7a. Indien ja, van wie?
8. Wordt u door een instantie bijgestaan met kennis over emissiearm binnenstedelijk transport?
 - 8a. Indien ja, door welke instantie?
 - 8b. Met welke informatie?
9. Hebben wetten en regels invloed op uw huidige manier van stedelijke distributie?
 - 9a. Indien ja, positief of negatief?
 - 9b. Indien ja, kunt u een voorbeeld geven?
10. Deelt u kennis, informatie of vergelijkbaar/werkt u samen met betrokkenen van stedelijke distributie, zoals leveranciers, verladere of klanten?
 - 10a. Indien ja, met welke partijen?
 - 10b. Op welke manier?
11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)

12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			
Anders			

13. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer? (Routes, Hubs, venstertijden)
14. Beoogd wordt dat in 2025 in Groningen geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van Groningen komen.
- 14a. Wat vindt u van deze beslissing?
- 14b. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
- 14c. Hebt u hier middelen of kennis voor nodig die u niet heeft?
15. Verwacht u een stijging van transportkosten in de keten door gebruik van een extra overslagpunt?
- 15a. Welk percentage/ bedrag per levering?
16. Biedt u service op maat aan verladers of retailers?
17. Wat zijn afwegingen van de locatiekeuze geweest?
18. Er zijn verschillende voorbeelden van hubs die het slechts enkele jaren uithouden. Hoe gaat de Goederenhub in Westerhaven het beter doen?
19. Zijn er goederen (bijvoorbeeld hangende kleding, gekoelde of waardevolle producten) die niet geconsolideerd kunnen worden in deze hub?

III.VII Transport en Logistiek Nederland (TLN)

1. Wat is volgens u de beschrijving van een 'stedelijk distributiecentrum'?

In mijn onderzoek is een stedelijk distributie centrum een plaats waar goederen van verschillende partijen samengevoegd (geconsolideerd) worden, om de goederen vervolgens met emissiearm vervoer naar een binnenstad te transporteren.

2. Hoe bent u betrokken in het huidige binnenstedelijke vrachttransport?
 - 2a. En in Groningen specifiek?
3. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, bevorderd? (Positief beïnvloed door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 3a. Zo ja, door wie en/of wat?
 - 3b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
4. Wordt de huidige manier van binnenstedelijke bevoorrading, waarbij vrachtwagens veelal 1 á enkele adres(-sen) bevoorraden per centrum, belemmerd? (door macht/invloed vanuit bijvoorbeeld de gemeente, politiek, kosten, bedrijven enz.)
 - 4a. Zo ja, door wie en/of wat?
 - 4b. Wat is diens invloed op uw manier van binnenstedelijk vrachttransport
5. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading bevorderd?
 - 5a. Zo ja, hoe?
6. Worden duurzame alternatieven voor de huidige wijze van binnenstedelijke bevoorrading belemmerd?
 - 6a. Zo ja, hoe?
7. Ontvangt u(w branche) momenteel subsidies met betrekking tot emissiearm stedelijk vrachttransport?
 - 7a. Indien ja, van wie?
8. Wordt u(w branche) door een instantie bijgestaan met kennis over emissiearm stedelijk vrachttransport?
 - 8a. Indien ja, door welke instantie?
 - 8b. Met welke informatie?
9. Hebben wetten en regels invloed op de huidige manier van stedelijke distributie door transporteurs?
 - 9a. Indien ja, positief of negatief?
 - 9b. Indien ja, kunt u een voorbeeld geven?
10. Deelt u kennis, informatie of vergelijkbaar met betrokkenen van stedelijke distributie, zoals leveranciers, distributiecentra of klanten?
 - 10a. Indien ja, met welke partijen?
 - 10b. Op welke manier?
11. In hoeverre vindt samenwerking met 'partij' plaats met betrekking tot binnenstedelijk vrachttransport. (X)

12. In hoeverre acht u samenwerking met 'partij' van belang bij binnenstedelijk vrachttransport via een stedelijk distributiecentrum? (O)

Partij	Geen samenwerking	Nauwelijks samenwerking	Deze partij is essentieel
Verladers			
Vervoerders			
Pakketdiensten			
Gemeente			
Ontvangers/winkeliers			
Provincie			
Rijksoverheid			
Anders			
Anders			

13. Hoe kijkt u(w branche) naar het delen van opslagruimte en middelen met andere partijen (concurrenten)?
14. Bent u in de afgelopen 5 jaar betrokken bij ruimtelijke of bestuurlijke ingrepen gerelateerd aan binnenstedelijk goederenvervoer? (Routes, Hubs, venstertijden)
15. Beoogd wordt dat in 2025 geen vervuilende (uitstoot producerende) voertuigen meer in de binnenstad van onder andere Groningen komen.
- 15a. Was u hiermee bekend?
- 15b. Wat vindt u van deze beslissing?
- 15c. Welke gevolgen voorziet u voor transporteurs hierdoor?
- 15d. Wat verwacht u dat dit betekent voor uw rol of plek in binnenstedelijk vrachttransport?
- 15e. Hebt u hier middelen of kennis voor nodig die u niet heeft?
16. Zou u(w branche) een stijging van uw transportkosten over hebben voor een bijdrage aan een emissievrije binnenstad?
- 16a. Welk percentage/ bedrag per levering?
17. Hoe denkt u over om de 'last mile' door een derde partij uit te laten voeren (met als doel dat de binnenstad emissievrij en leefbaarder wordt)?
18. Ziet u potentie in een stedelijk distributie centrum?
- 18a. Kunt u een inschatting maken hoeveel procent van de vracht geschikt is voor gebruik van een stedelijk distributie centrum?
19. Zou u gebruik willen maken van een gedeeld stedelijk distributie centrum?
- 19a. Waarom wel/niet?
- 19b. Heeft u randvoorwaarden waaraan dit centrum aan kan voldoen (bijvoorbeeld: service, locatie, eigen/extern beheer) (Wanneer zou u er wel gebruik van maken?)
- 19c. Ziet u belemmeringen voor het gebruik van een stedelijk distributie centrum voor uw organisatie?
20. Ziet u een rol voor uw organisatie in de totstandkoming van en/of bij het functioneren van een stedelijk distributie centrum?
- 20a. Indien ja, welke?