Using the Smart City Strategy for Sustainable Parcel Delivery

A Groningen Case Study

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Abstract

Urban freight transport (UFT) is under pressure due to rapid urbanization and climate change. This results in the introduction of various measures and restrictions, forcing parcel delivery services (PDS) to deliver more efficient and sustainable. This would theoretically be possible with the help of the Smart City (SC) strategy, defined by the domains governance, people and technology. According to literature, technology is seen as the most common domain of the SC. These domains can be operationalized, using Smart Measures (SM) from the European NOVELOG (2016) framework. However, it should be noted that the applicability of these measures depend on their urban context. Thus, case studies and pilots are needed to investigate NOVELOG's SM in different areas. This thesis researches the application of SM in the city of Groningen, in the context of the SC strategy. An exploratory case-study approach is used to conduct the research, applying both inductive and deductive codes to policy documents and semi-structured interviews. The results are presented using circle charts and quotes from various documents to clarify to what extent the Groningen government applies a SC strategy in its policies for PDS. The analysis of the policy documents and interviews show that Groningen is planning to implement multiple SM over the next few years, but most of these SM are still in progress and currently not yet operational. Groningen is therefore working on a SC strategy, but the results cannot yet be seen in practice. The research shows that the most common domain of the SC strategy in Groningen is governance, instead of the hypothesised technology domain. Currently, Groningen is planning to implement SM for its city, but to measure the improvement of sustainability in absolute numbers, Groningen needs to be properly mapped out. This thesis proposes to do a baseline measurement, for example on CO2 levels and sound measurements. In addition, the applied SM in Groningen could well be subject of a comparative study with other cities' appliance of SM.

List of abbreviations

ANPR = Automatic Numberplate Recognition
PDS = Parcel Delivery Services
SC = Smart City
SM = Smart Measures
UFT = Urban Freight Transport

Colophon

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1. Background

As global temperature continues to rise and the world becomes more urbanised, societies and ecosystems are increasingly impacted by climate change (Novalia & Malekpour, 2020; Fedele et al., 2019). In addition, there are also growing concerns about rapid urbanisation and changing demographics (Taniguchi, 2014). A combination of these conditions ensures that some of these climate change problems cause difficulties in these rapidly urbanising areas, and therefore these areas are a vulnerability for humanity, as described by Fedele et al. (2019).

In today's society, speed and flexibility are of great importance and besides that there has been an tremendous growth in delivery services. This is noticeable in terms of growth in revenue, number of consumers ordering online, number of online orders, and parcels distributed to end consumers (Giannikas & McFarlane, 2021). Various PDS such as PostNL and DHL operate in the Netherlands. Due to a huge increase in digital platforms in combination with high urbanisation rates, these delivery companies can be found all over the world, but especially in these urban areas. Development of adequate infrastructure and transport systems cannot keep up with the fast urbanisation rate (Janjevic & Wenckebach, 2020). In addition, a conflict emerges regarding the current climate change problems and the imposed European restrictions, towards zero emission UFT by 2050. To anticipate to these developments, delivery services must deliver products as efficiently and sustainable as possible. Thus, practices in UFT are facing difficulties to balance between economic profit and social and ecological protection (Pan et al, 2021). Optimising UFT can help to maintain profitability, while also making cities more sustainable. This optimisation can lead to the alleviation of negative externalities of UFT (e.g. traffic congestion, emissions and noise effects) in urban areas (NOVELOG, 2016). The Smart City (SC) strategy might help to increase this optimisation and thus gain sustainability. This is due to the fact that the SC aims at tackling problems in urban areas, such as traffic, pollution, energy consumption and waste treatment (Benevolo, 2016). The optimisation and increased efficiency of parcel delivery, within the field of UFT, could lead to an increased level of sustainability in urban areas (NOVELOG, 2016 & Pan et al., 2021).

1.1 Academic and Societal relevance

To solve urban problems, the Smart City (SC) is perceived as a winning strategy by scholars (Benevolo, 2016). This is because the SC should address problems in urban areas, such as traffic, pollution, energy consumption and waste treatment and should lead to more sustainability. Furthermore, Benevolo also states that the SC is seen as a long-term vision for creating a better urban area. The SC aims to reduce the cities' environmental footprint and as a consequence ensures a better quality of life for citizens.

A literature analysis conducted by Meijer & Bolívar (2016) shows that different publications on the SC, define the SC differently and emphasis is placed on different aspects. These aspects are, according to them:

> *(1) Smart technology, smart people or smart collaborations as a defining feature of a SC, (2) incremental and transformative perspectives on urban governance, or (3) better outcomes or a more open process as the legitimacy claim for smart city governance" (p. 392)*

This leads to the conclusion that the SC is of a multidisciplinary nature (Meijer & Bolívar). However, their literature review also states that most literature focuses on technological aspects, but less on governance or human capital in the smart city. This is also supported

by Nam & Pardo (2011), which states that most studies on practices of SC address issues of technological infrastructures and enabling technologies.

The European NOVELOG (2016) project includes an operationalisation of SM, which represents an execution of the SC strategy. This allows their framework to assess the complexity and sustainability of current UFT systems. The NOVELOG (2016) framework was created for use in urban areas. Urban areas differ significantly from each other, thus assessments of the appliance of SM and the overarching SC strategy in different urban contexts is required. This illustrates a very specific research gap. The city of Groningen is such a specific urban context, where they aim to achieve a higher quality of life for inhabitants and more sustainability. They plan to achieve this by reducing the negative externalities of UFT and parcel delivery in the city centre (Municipality of Groningen, 2020). For this thesis, Groningen and their possible appliance of a SC strategy in the field of parcel delivery in UFT is researched with an exploratory case study.

2. Research problem

Due to the multidisciplinary nature of the SC and its high dependence on specific contexts, the SC needs to be explored even more with case studies. This raises questions of whether technology is always the most common defining domain of the SC or can the other domains also be leading in a specific context? How are these domains represented and can they actually help with gaining sustainability in the field of UFT and in particular for parcel delivery services (PDS)? And can the NOVELOG (2016) framework, as a means to assess complexity and sustainability in current UFT systems, help to evaluate smart measures within UFT and how is this reflected in a specific context?

This thesis attempts to add information to the above mentioned research gaps by researching the functioning of the SC strategy in a specific urban context. To specify, this thesis will try to gain a better understanding of the SC strategy, with the corresponding NOVELOG SM, by means of an exploratory case study in Groningen. The aim of this thesis is to investigate whether SC developments in the field of parcel delivery UFT in Groningen are applied, to what extent and why. In addition, it is investigated whether SC developments can improve the living environment and reduce the cities' environmental footprint. This leads to the following main research question and the corresponding sub questions:

How is the smart city strategy applied and does it contribute to more sustainability in the parcel delivery urban freight transport in the city of Groningen?

1. How can the SC strategy contribute to sustainability in parcel delivery UFT?
2. How are smart measures, using the European NOVELOG (2016) framework, applied in Groningen?
3. What are the current policy strategies on sustainability in the field of parcel delivery UFT in Groningen and how can these be improved?
4. To what extent is the SC strategy applied in Groningen?

3. Theoretical framework

The main concepts in this thesis are the SC, sustainability and UFT. In this section the main concepts will be explained and defined for this thesis, using literature. Afterwards, the relationships between the concepts will be explained, and visualised with a conceptual model.

3.1 The Smart City

The concept of the SC is widely discussed and hard to define since different publications place their emphasis on other aspects of the concept. Figure 1 shows a broad overview of all aspects of urban life included in the SC. The SC impacts all the urban infrastructures and a strong information and communication infrastructure should support knowledge management (Dameri, 2017). This thesis only focusses on the domain of parcel delivery UFT within the SC. The UFT domain is shown with a red demarcation in figure 1. The underlying management of smart UFT, is indicated in figure 1 with a green demarcation.

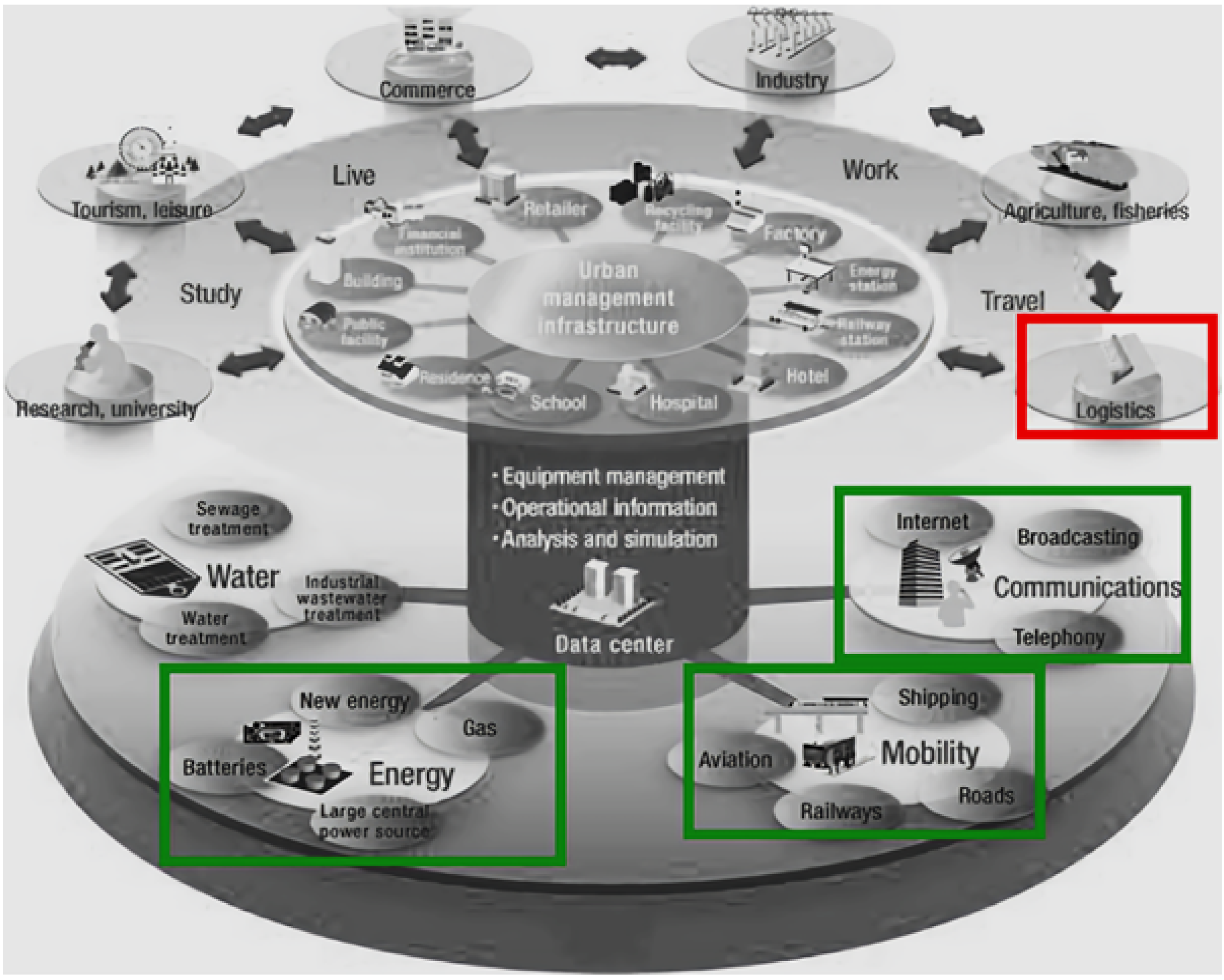


Figure 1- The Smart City (KhichdiOnline, 2015)

According to Caragliu et al. (2011) the SC is identified with six main axes (dimensions). The axes are: a smart economy; smart mobility; a smart environment; smart people; smart living; and, finally, smart governance. After this finding Caragliu et al. (2011) made a definition themselves, which is as follows:

"We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance." (p.70)

This definition also emphasises the previously made point by Meijer & Bolívar (2016), that the concept of SC exists of different feautures. These defining features of a SC are the domains smart technology, smart people and smart collaborations (Meijer & Bolívar, 2016). To support these defining features of Meijer & Bolívar (2016), the three domains mentioned by Nam & Pardo (2011), are respectively technology, people and community. They describe the domains as follows: The technology domain consists of digital networks, infrastructure and applications, used for sharing information to organisations and social groups. Besides that, the people domain consists of creativity, education and knowledge. The community domain can also be described as the institutional or governance domain, since it is defined as stakeholders, organisations and governing institutions working together in partnerships. In these partnerships information technologies are used to make conscious decisions to transform life and work in their community in significant and positive ways.

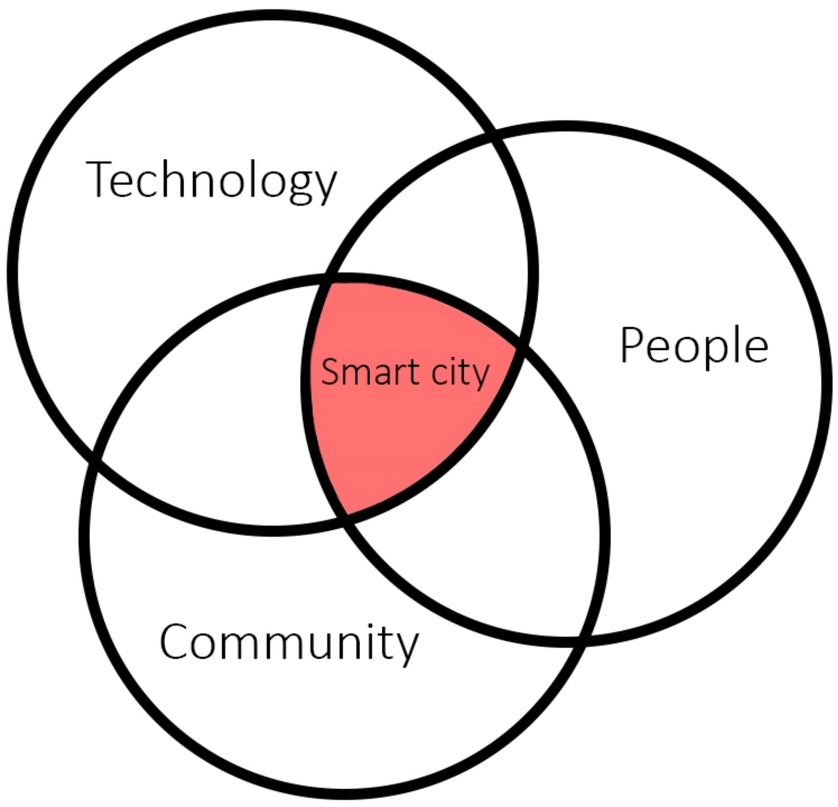


Figure 2- Dimension SC displayed in figure

However, there are doubts about the concept of the SC. This is due to the high dependence on technology (Yigitcanlar & Kamruzzaman, 2018) and its relationship with sustainability. SCs are often associated with sustainability, but this does not mean that SCs are by definition always sustainable (D'Auria, 2018). For this thesis three domains of the SC are used (see Figure 2), which are defined as technology, people and governance by Nam & Pardo (2011) and Meijer & Bolívar (2016). Operationalisations of these domains according to the NOVELOG (2016) framework are: Electric vehicles (Technology), access control (Governance) and training (People). The NOVELOG (2016) framework can be found in "6. Data Analysis" and "Appendix D"

3.2 Sustainability

A well-known definition of sustainability, originates from the Brundtland Report (1987), which defines sustainable development as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

This is a very broad definition. Sustainability is difficult to measure and can it be expressed in many aspects or values. In the realm of UFT, these aspects can already be made more specific, as is done, by for example Nathanail et al.(2017). They evaluate sustainability of UFT by the alleviation of traffic congestion, the mitigation of CO2 emissions and noise impacts. A research conducted by Kauf (2016) advocates for shortening transport routes, to lower negative externalities of transport. A few externalities mentioned are CO2 emissions, noise and the number of cars, which is in accordance with Nathanail et al. (2017).

For this thesis banning negative externalities, by optimising UFT, is seen as gaining a higher level of sustainability. This is not a general concept of sustainability, but how sustainability is seen in this thesis. In this thesis, sustainability is only described in the specific context of PDS in UFT.

3.3 Urban Freight Transport

According to Savelsbergh & Van Woensel (2016), UFT deals with the physical distribution of goods to a final destination within urban areas. This passes with respect to a set of objectives such as effective services, cost-effectiveness and sustainable development . UFT as defined by Taniguchi (2014) are all logistic and transport activities done by private companies, with the support of advanced information systems in urban areas. During these activities traffic, environment, congestion, safety and energy savings are considered within the framework of a market economy. This definition focuses on private companies, which often provide transport in urban areas, aiming at turning sales and profit. For this thesis the main focus is on freight carriers and administrators within the city of Groningen.

Attention is paid to the negative externalities that develop in the city itself as a result of the current system of UFT. At its core, this problem stems from the consumption patterns of the population (Kauf, 2016), but inefficient UFT can enlarge the emergence of negative externalities. UFT includes many types of transport, but in order to arrive at the most feasible results, this thesis only considers a specific form of UFT, namely parcel delivery. This mode of logistics was chosen, since it mainly concerns private companies, where the tension between sustainability and profit plays a major role compared to government managed logistics. For example, PostNL, which is listed on the stock exchange and intended to make profit (PostNL, 2021).

In addition, "smart" solutions can also be distinguished in the field of UFT. Smart logistics solutions are developed to allay cities' logistic problems and support urban freight transport measures, policies or replace them entirely (Karakikes & Nathanail, 2016). Different smart logistics solutions are included in NOVELOG (2016), which is an European evaluation framework. Smart solutions included in this framework are multimodality, urban consolidation centers, cargo bikes, electric vehicles, access regulation, etc.

3.4 Conceptual Model

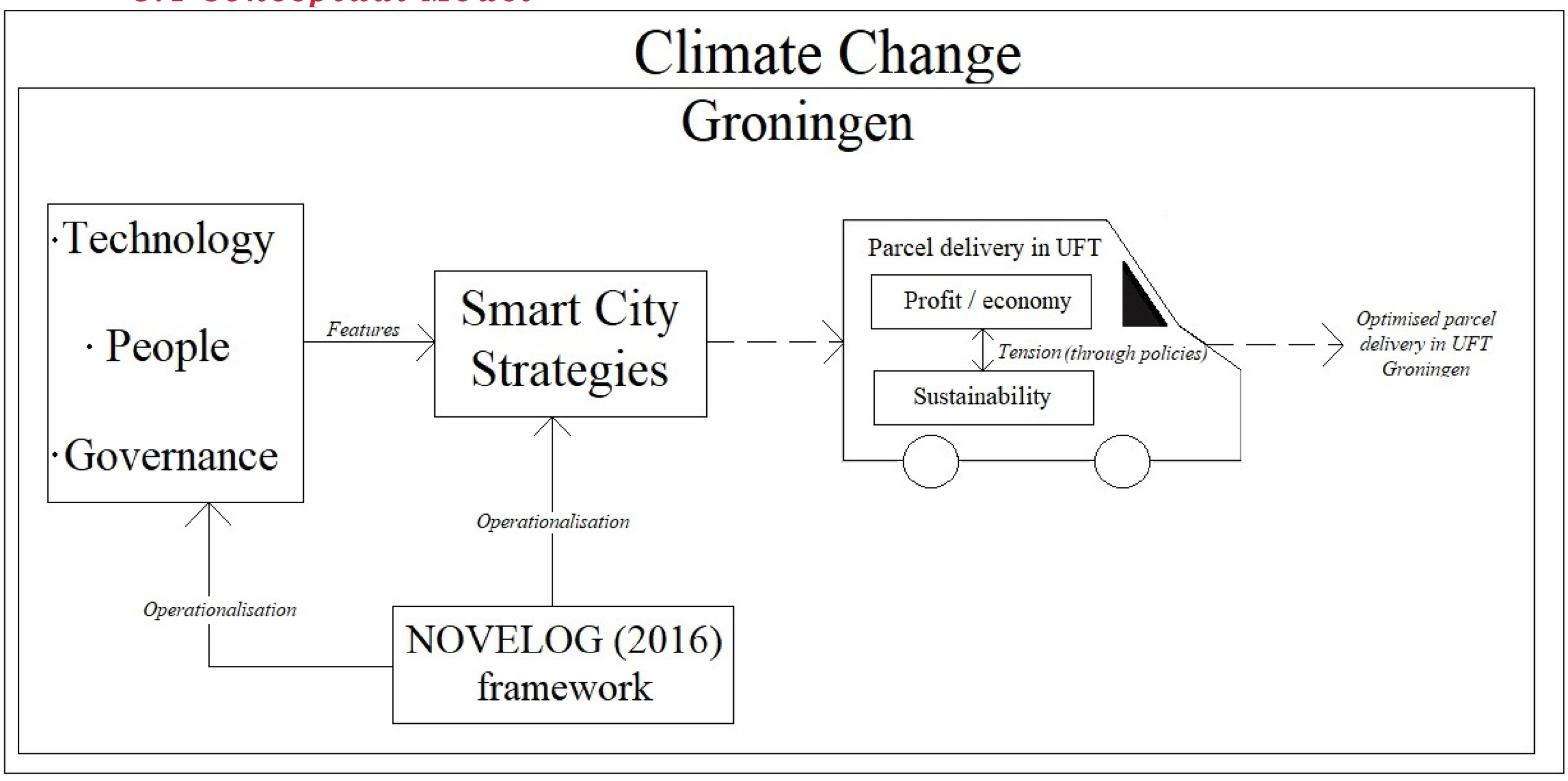


Figure 3- Conceptual Model

The conceptual model (figure 3) shows the main concepts within this thesis and their interrelation. It shows the tension between economy/profit and sustainability, within parcel delivery UFT. The dashed arrow from SC towards the field of UFT represents the question whether the SC strategy can relieve this tension and create more sustainability in a specific context. This specific context is the city of Groningen, and that is why Groningen as a context is created around the conceptual model. The tension within the field of UFT and the SC strategy both raise due to the occurrence and awareness of climate change. Therefore, the whole thesis is placed within the context of climate change. Various aspects of the SC are described in literature, but the main focus is on the domains 'technology, people and governance', which are also shown in the conceptual model. Parcel delivery UFT will also be considered from the context of the SC. Finally, the NOVELOG (2016) framework will be used for deductive coding. This framework is an operationalisation of the SM within the SC and its three defining domains. This should lead to the output of UFT being optimized, which explains the arrow and optimized UFT on the right side of the model.

4. Hypotheses

Based on the theoretical framework and conceptual model explained above, it is expected that the SC as a strategy can contribute to more sustainability within the field of UFT in the city of Groningen. However, it is also expected that the tension between economy and environment will only decrease in a limited way, since the SC is of a multidisciplinary nature developments in the SC strategy will not be proportional.

For example, the people domain also includes human behaviour and habits, which are hard to change and actually changing in a opposite direction (e.g. the current consumption pattern is demanding more and more from UFT strategies (Giannikas & McFarlane, 2021)). However, changes in current habits can develop as well, by for example collecting parcels at dedicated locations instead of receiving them home. The question then becomes how does the city of Groningen deal with sustainable UFT and what could be improved. It is expected that the city of Groningen is already interested and involved in making UFT more sustainable, and that this is mainly taking place in the technological domain. In addition, this technological domain is expected to refer primarily to the transition to alternative energy sources, such as electric driven vehicles.

5. Methodology

For this thesis, different methods are used, all of which are qualitative methods. A qualitative research method was chosen as it investigates local knowledge and understanding of a given program. This includes people's experiences, meanings and relationships, and social processes (Mohajan, 2018). This is fitting for a study on the SC, due to its multidisciplinary nature (Meijer & Bolívar, 2016). The chosen methods for data collection will be a semi-structured interviews and a policy document analysis. This approach of mixed methods is also called triangulation, and is used to try and maximize an understanding of the research problem (Clifford et al., 2016). In order to act ethically during the research, an ethical consideration has been written, which can be found in Appendix F.

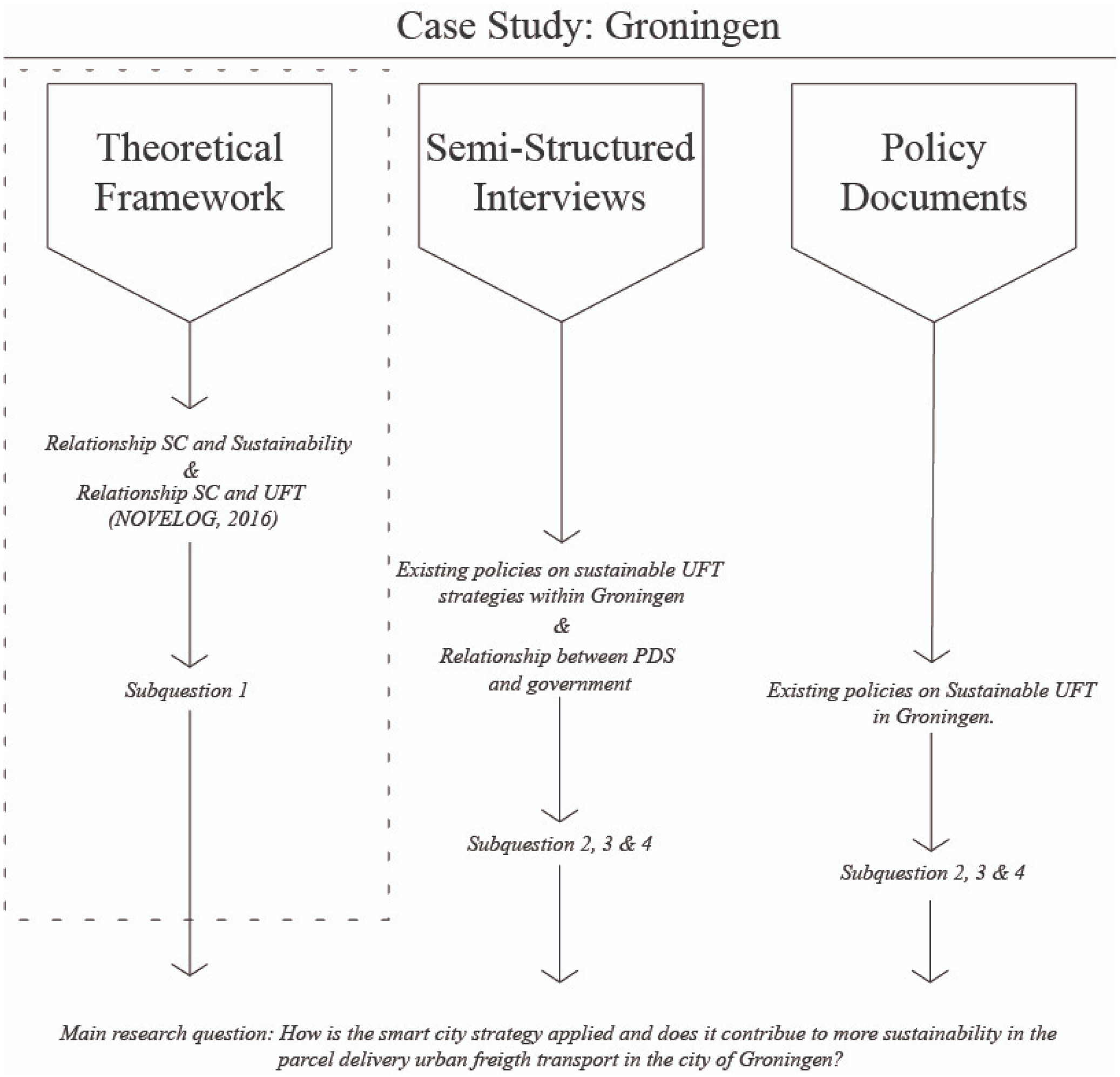


Figure 4 - Overview data collection methods and their purpose

5.1 Case Study

The research takes place in the specific context of Groningen, thus a case study will be conducted. A case study methodology involves a holistic view of the case, as well as exploring aspects in depth. It therefore provides knowledge to learn about the meanings constructed by people within a certain socio-cultural context (Clifford et al., 2016). A case study provides context-dependent knowledge, which is in this case UFT in Groningen. Context-dependent knowledge contains voices, actions, and interactions between stakeholders of a certain site (Miles, 2015). For this thesis an exploratory case study approach is conducted. According to Yin (2014) the timeframe of a case study is contemporary to the researcher, which makes case studies suitable for research in present or future phenomena. The exploratory case study in particular is fitting, since this method is mostly oriented towards knowledge gaps for future developments. This is also the case for the SC strategy in Groningen, since the strategy is embedded in future policy domains (Yin, 2009).

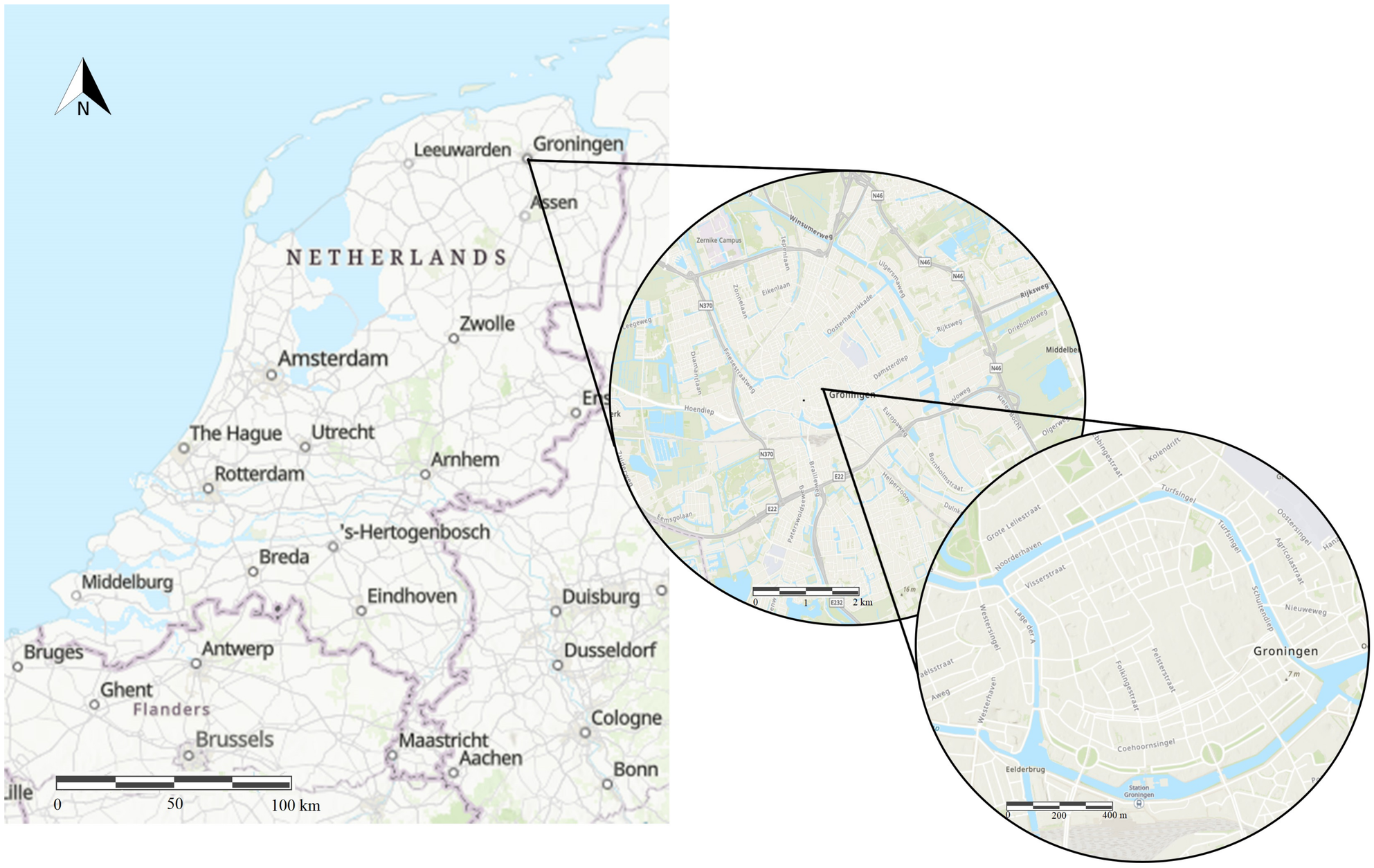


Figure 5 - Researched Case Study area Groningen (ArcGis, 2021)

Groningen was chosen for this thesis because the city of Groningen already embraced policies for the future regarding zero-emission UFT. In these finished policy plans they also indicate that they are planning to apply a smart city center approach in their city centre (Binnenstad Groningen, 2020). In addition, Groningen is one of the fastest growing cities in terms of population (Binnenstad Groningen - Ruimte voor jou , 2020), and as a result, the city center is under pressure. The city center functions as a highly densified hub with mixed functions, due to the increasing passenger numbers. Freight transport is growing fast in the and the municipality of Groningen has developed new policies concerning UFT. Finally, according to own experiences, many parcel delivery services operate here and the University of Groningen itself is located here.

5.2 Data Collection Methods

As mentioned before, the case study makes use of triangulation of research methods. The chosen methods for data collection are semi-structured interviews and policy documents. Since the theoretical framework is used to gain a broad understanding of the concepts and its relationships. Thus, even though no new data is gathered, the theoretical framework is mentioned in figure 4. In figure 4 a data collection methods scheme can be seen, this scheme contains the data collection methods, their purpose and the sub questions they answer to.

5.2.1 Policy Documents

A policy document analysis will be conducted to gain information on the implementation of SM in Groningen. With the help of the policy document analysis, it is investigated which SM are implemented and how they are implemented in Groningen. The policy documents are thoroughly read twice, whereby the documents are coded, according to the code tree in Appendix D. This process is as follows: if measures regarding sustainable UFT are mentioned in the policy documents, they will be selected with the surrounding information. Multiple quotes will emerge in this process and the codes found in appendix D will be linked according to the matching information found in these quotes. This process of coding will be executed using ATLAS.ti 9. The chosen policy documents are from the municipality of Groningen, and are available on their website. They were selected based on their detailed description on policy plans regarding the new city center and sustainable UFT. An overview of the policy documents can be found in Appendix E.

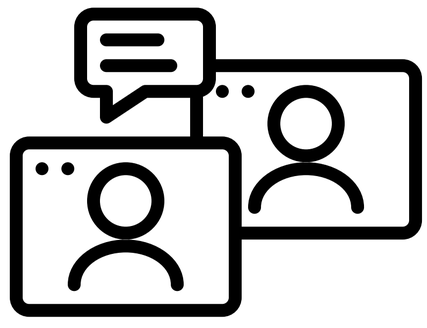
5.2.2 Semi-Structured Interviews

Primary data will be collected using Semi-Structured Interviews, concerning public and private stakeholders involved in the UFT of Groningen. The interviews will focus on experiences in Groningen and gain a deeper explanation of the policies, rather than the existing policies themselves.

The stakeholders chosen for the interviews are the local municipality and the largest operating parcel delivery service PostNL. Semi-structured interviews are chosen as a method, since they are useful for examining power relations and social processes in a geographical content. The interviews are partially structured and allow respondents to have an open response, rather than only ‘yes’ and ‘no’ (Clifford et al., 2016). The semi-structured interviews will be recorded using “Audacity” on Windows 10 and “Dictafoon Pro” on IOS, afterwards they will be transcribed using ATLAS.ti 9. The interview guide for parcel delivery services can be found in Appendix 1 and the interview guide for the municipality can be found in Appendix 2. A consent form was signed by the interviewees before the interviews, in which they both indicated that they did not need to remain anonymous. An overview of the interviewees can therefore be found below, in table 1. The interviews will be conducted and transcribed in Dutch, after which the results will be discussed in English.

Name	Company	Method
Jorick Dam	PostNL	Semi-structured interview
Sjouke van der Vlugt	Municipality of Groningen	Semi-structured interview

Table 1 - Overview interviewees



6. Data Analysis

Data analysis is conducted on the basis of 29 codes, which are shown in table 2. This table also provides an explanation of the codes. The table consists of both deductive and inductive codes, based on Hodge & Greve (2007), Karakikes & Nathanail (2017) and the NOVELOG (2016) evaluation framework for sustainable UFT, complemented by inductive codes. The inductive codes are based on additional information, which was lacking in the NOVELOG (2016) framework, and are found in policy documents and interviews. Therefore these codes are exclusively based on the city of Groningen. The sustainable UFT measures are all classified within the three domains of the smart city strategy (Technology, Governance and people). The coding tree can be found in Appendix D, where a hierarchy of the codes is displayed. In the coding tree green codes represent inductive codes and red codes represent deductive codes. After coding the data, the coding will lead to an analysis on how and how much of these "Smart" UFT solutions are applied in Groningen. This will be supplemented with a qualitative explanation, using quotes.

Code Group	**Code**	**Explanation**
Technology	Multimodality for urban freight	Transfer of goods, using several modes of transport (e.g. ships, vans, cargo bikes, etc.)
	Urban consolidation centres	Distribution and logistics models for operators, incorporating mostly measures initiated by the private sector, such as off-peak deliveries, consolidation or collaboration schemes and joint operations.
	Trans-shipment facilities	Infrastructure development, pertaining to the designing, construction and development of consolidation/distribution centers and logistics premises, such as interchanges and trans-shipment areas or terminals.
	Intelligent Transportation System (ITS) for freight monitoring and planning/routing	Use of advanced information technologies, intelligent transport systems of information and communication technology.
	City lockers	Development of City Lockers, located close to receivers, with the advantage that transportation to only one location is needed to supply the lockers.
	Cargo bikes (for B2B and B2C)	Transition to greener – environmental friendly ways of transport (e.g. electric, LPG or natural gas freight vehicles)
	Electric vehicles diffusion in businesses (zero-emission transport)	Transition to greener – environmental friendly ways of transport (e.g. electric, LPG or natural gas freight vehicles)
	The use of sustainable vehicles, other than cargo bikes or electric vehicles	Transition to greener – environmental friendly ways of transport (e.g. electric, LPG or natural gas freight vehicles)
	Reverse Logistics integration into supply chain	Integration related to reuse of products and materials (e.g. recycling, reclamation, refurbishment, and reselling) that have been restocked.
Governance	Loading/Unloading areas and parking	Capacity sharing, in the meaning of infrastructure and equipment sharing amongst multiple operators, stakeholders and different transportation modes, such as the multi-use lanes concept
	Multi-users lanes	Capacity sharing, in the meaning of infrastructure and equipment sharing amongst multiple operators, stakeholders and different transportation modes, such as the multi-use lanes concept, which can be used at certain times by certain user groups.

	Access by emission zones (Zoning)	Access control: Incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Access by time windows (Zoning)	Access control: Incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Access by load factor (Vehicle requirements)	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Businesses recognition scheme	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Urban planning measures (physical)	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Off peak deliveries (dynamic systems)	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Complete prohibition of certain vehicles	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Updating exemption policies	Access control: incorporating policies and measures that imply access restrictions to certain areas based on concrete constraints (environmental, vehicle weight, time, etc.), traffic calming measures in zones (e.g. historic city centers) etc.
	Privilege policies	Access control: Advantages for parties who are ahead and ambitious for policy plans (e.g. already having greener - environmental friendly transportation). Instead of restricting, enabling access.
	Harmonization and simplification of city logistics rules	Clear and equal rules for all stakeholders.
	Enforcement and ITS adoption for control and traffic management	Routing optimization, concerning infrastructure and road marking or signing for route optimization.
	Surveillance and enforcement	Enforcement, integrating all police enforcement actions or smart enforcement systems.
	Financial relationship (PPPs)	Public-Private Partnerships: Collaboration and informing of stakeholders
	Organisational relationship (PPPs)	Public-Private Partnerships Collaboration and informing of stakeholders
	Joining the debate	Collaboration and informing of stakeholders
People	Training	Training, including activities such as the tutoring and promotion of safe and eco driving.
	Access to information	Access to highly trained staff, residents and organisations (e.g. university).
	Routine changes	Changing routines (obliged) to achieve the desired end result

Table 2 - Overview applied codes and their explanation

7. Results

In this chapter the results found within the collected data will be displayed and discussed. First, a short general overview of the collected data will be given, after which the different domains of the SC will be examined in chapters. In these chapters the results of the policy document analysis are integrated with the results from the interviews. This results in a clearer and deeper understanding of the current situation in Groningen with regard to sustainable UFT. After that, additional information which has emerged from the interviews, but is not mentioned in the policy documents, will be discussed in a separate chapter.

7.1 General Overview

In total, 675 codes were identified and added to the policy documents. 477 codes where added to the governance domain. 172 and 26 codes have been added respectively to the domains of technology and people.

An overview of the frequency of the used codes in the three domains can be seen in table 3.

Domain	Frequency Codes
Governance	477
People	26
Technology	172
Total	675

Table 3 - Overview code frequencies

7.2 Governance

As mentioned previously, the governance domain is the largest and most prevalent domain. The domain is subdivided into 17 codes, and the frequencies of these codes can be seen in figure 6.

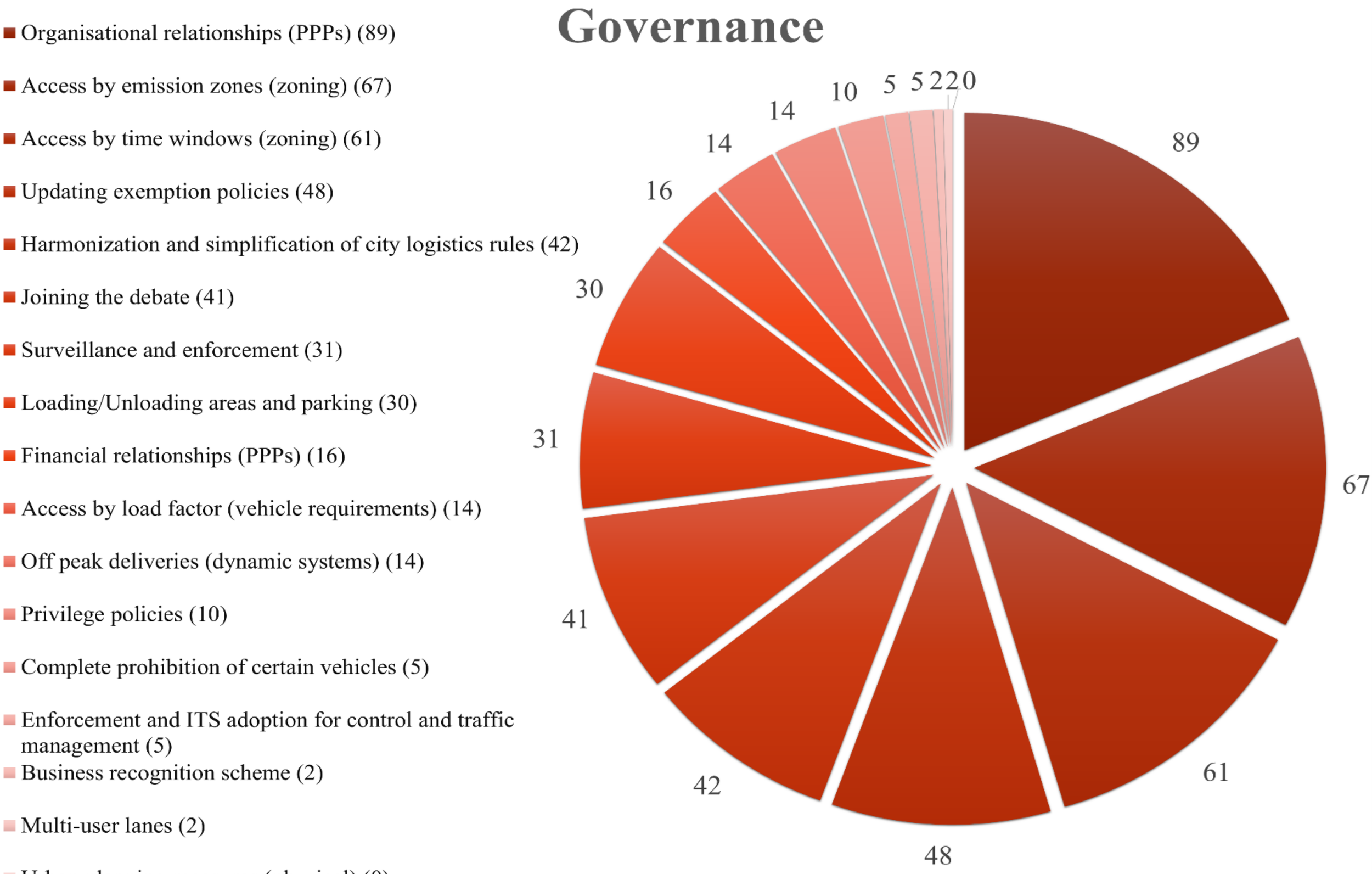


Figure 6 - Outcomes governance domain

7.2.1 Partnerships

Here it can be seen that within the governance domain the code ‘Organisational relationships (PPPs)” is most often linked to quotes in the policy documents. In the policy documents it is often emphasized that the municipality is planning to participate in cooperation with entrepreneurs, transporters and residents, after which experiments are developed jointly (p. 2 in Municipality of Groningen, 2020). This is also confirmed in the interview with PostNL, in which it was stated that the Municipality of Groningen is allowing and helping them with testing and piloting, on how they can comply with the renewed rules in the city center. This has already led to a pilot with light electric freight transport. Thereby, it was also indicated that there was support from the municipality with subsidies, this is called the SURFLOGH project (Interview PostNL, 2021). This financial support from the municipality mentioned above is also coded with the code "financial relationships (PPPs)". These financial relationships mainly refer to certain projects, such as the SURFLOGH project and ULaaDS project, which are subsidised from a European level. In addition, the documents often mention that the purchase of electric vehicles is stimulated by making subsidies available for entrepreneurs:

"The Cabinet wants to meet entrepreneurs in the purchase costs, which are now even higher for an emission-free delivery van or truck. Entrepreneurs can qualify for a subsidy between 2021 and 2025" (p. 24 in Binnenstad Groningen - Ruimte voor jou, 2021)

Unclarity regarding finance can occasionally be found in the policy documents, namely in the field of surveillance and enforcement. The municipality of Groningen is planning on using Automatic Numberplate Recognition (ANPR) cameras for enforcement in the inner city, but the policy documents state that it is still unknown whether the government will make funding available for this. This surveillance is necessary because the municipality is committed to a high level of access control in the city center.

7.2.2 Access control

The municipality of Groningen indicates that they mainly want to implement access control with the help of zoning by means of time and emissions. In addition, they want to apply renewed, clearer but also stricter exemption policies in the municipality.

Quotes in the policy documents regarding these measures are coded with "Access by emission zones (zoning)" and "Access by time window (zoning)" and "Updating exemption policies", and are often found in the policy documents (see figure 6). For example, Groningen is planning to implement a time-window zone and zero-emission zone for UFT. The following information can be found in the policy document:

Figure 7 - Map of Groningen, in which it is indicated in pink what the zero-emission zone will be from 2025.

"In 2025 the ZE zone for city logistics in the city center of Groningen will come into effect. We already signed up to this ambition in 2014. The national climate agreement states that 30-40 Dutch cities must designate a medium-sized ZE zone for city logistics by 2020, i.e. the city center plus the surrounding neighbourhoods/districts" (p. 13 in Municipality of Groningen, 2020).

In addition, the municipality states:

'We are going to expand the window time area for logistics traffic' (p. 19 in Binnenstad Groningen - Ruimte voor jou, 2020) AND *'We regulate freight and delivery traffic by ensuring that the city center is free of motor vehicles between twelve and six o'clock.* ' (p. 8 in Binnenstad Groningen - Ruimte voor jou, 2020).

The planned contours of the zero-emission zone can be seen in figure 7. This development obliges transporters and entrepreneurs to work on emission-free transport and transport within designated time slots.

7.2.3 Other Governance measures

However, in the policy documents it is often emphasized that the municipality wants to implement these policies with participation from parties, residents, entrepreneurs and other stakeholders. For example, the municipality indicates that they want to conduct campaigns, taking people their opinions into account (joining the debate) and embark on partnerships (organisational partnerships (PPPs)). This is all done so that the consequences are as equal and clear as possible for everyone. On the other hand, other policy measures, mentioned in the NOVELOG (2016), are less applied in the city of Groningen. For example, physical urban planning measures (0), Multi-User lanes (2),

and Business recognition schemes (2). Thus, nowhere in the policy documents is it mentioned that the physical urban environment is modified in such a way that entry by certain transport vehicles becomes impossible. In addition, the business recognition schemes are also rarely mentioned, but a system is mentioned in the interviews to which this may be applicable. For example, both the Municipality of Groningen and PostNL indicate that they are interested in dynamic delivery planning, which could be combined with the business recognition schemes and the exemption policy. PostNL mentions;

"*Dynamically planning routes based on demand at a certain moment is a topic that we are indeed looking at, at the moment*"(Interview PostNL, 2021)

With these dynamic systems, PostNL mainly focuses on supply and demand, while the municipality focuses on the time windows within the same concept:

"*But what I would ultimately prefer is that we are not tied to those window times, but that we can plan that much more dynamically, so that supplies are available when it is really quiet.*"
(Interview Groningen, 2021)

This is also confirmed in the policy documents, where it is stated that in the future we are also working on a specific access policy for different target groups and vehicles (p. 12 in Binnenstad Groningen - Ruimte voor jou, 2020 & p. 13 in Municipality of Groningen, 2020)

7.3 People

The people domain consists of the fewest codes, 3 in total, and was least added to the policy documents (26). Figure 8 shows the coding outcomes of the people domain.

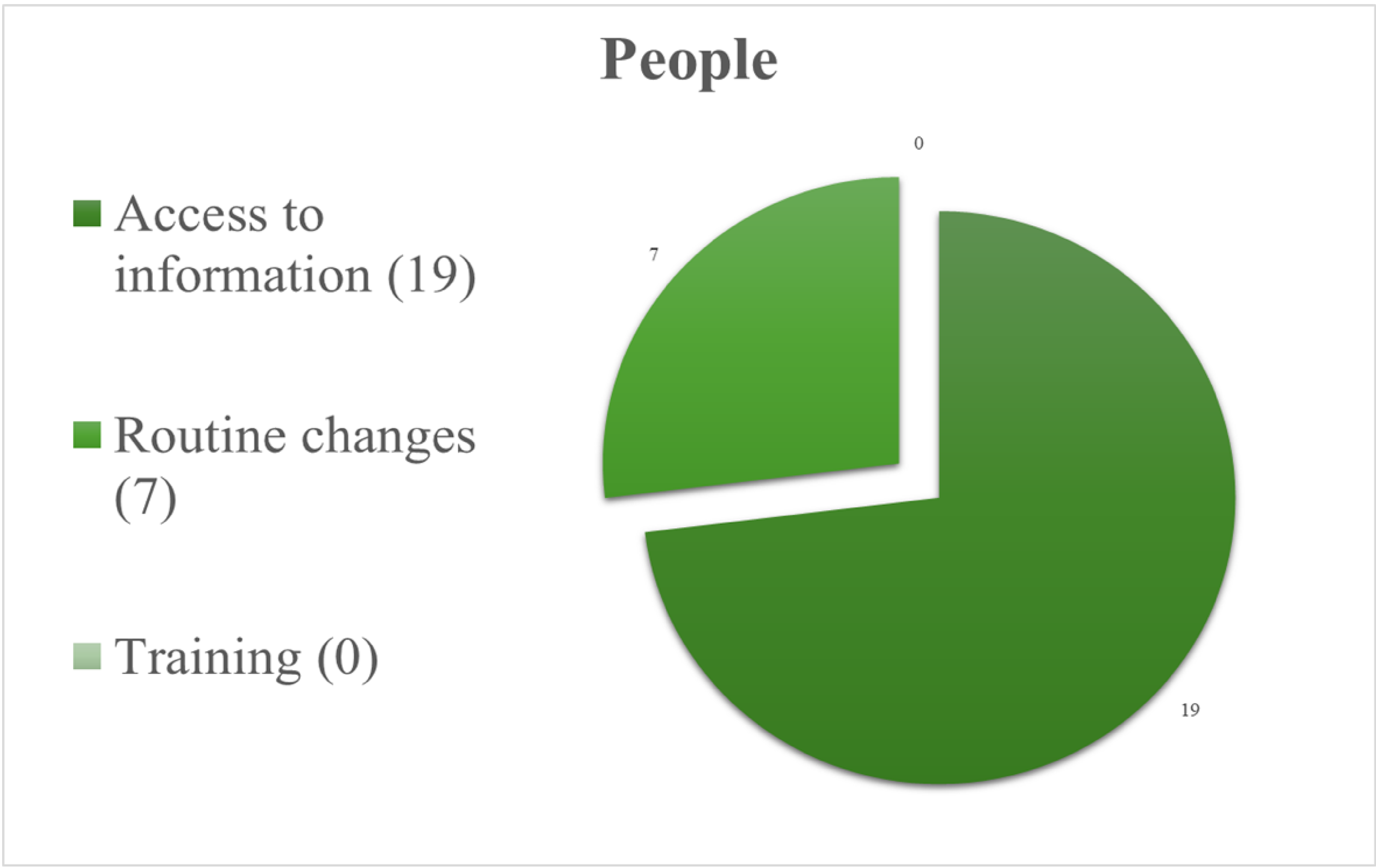


Figure 8 - Outcomes people domain

7.3.1 Access to information

The policy documents mainly refer to collaborations with educational institutions and them conducting research into UFT in the city center of Groningen. “In collaboration with educational institutions (Noorderpoort, Hanze University of Applied Sciences and RUG)” (p. 21 in Municipality of Groningen, 2020). This finding is also supported by the interviews, in which it is stated that the RUG does research on UFT as well. PostNL also describes the collaboration with the RUG and the municipality:

> “*We also have close contact with the University of Groningen. Because they often work together with the municipality in the subsidy process I just mentioned (SURFLOGH). But also to enrich concepts slightly from scientific literature, which you have less control over from the professional field. Yes, it just helps if someone just keeps an eye on it all the time, so to speak.*” (Interview PostNL, 2021).

7.3.2 Routine Changes

The code 'routine changes' is mainly found in the documents in combination with the major policy changes in the city center, such as zoning and the ambitious change to sustainable transport methods. The parties involved in the chain are required to adjust their behaviour and routines. (e.g. on p. 12 in Binnenstad Groningen - Ruimte voor jou, 2020). Noteworthy is the fact that training of staff, so that they operate more sustainable, could not be found in the policy documents. On the other hand, PostNL does indicate in the interview that they are working on this, by learning the "new driving" and thus also trying to get their principles on sustainability in the minds of employees (Interview PostNL, 2021).

7.4 Technology

The last domain is the technological domain. This domain consists of 9 codes, which have been added 172 times to the policy documents. Figure 9 shows the coding outcomes of the technology domain.

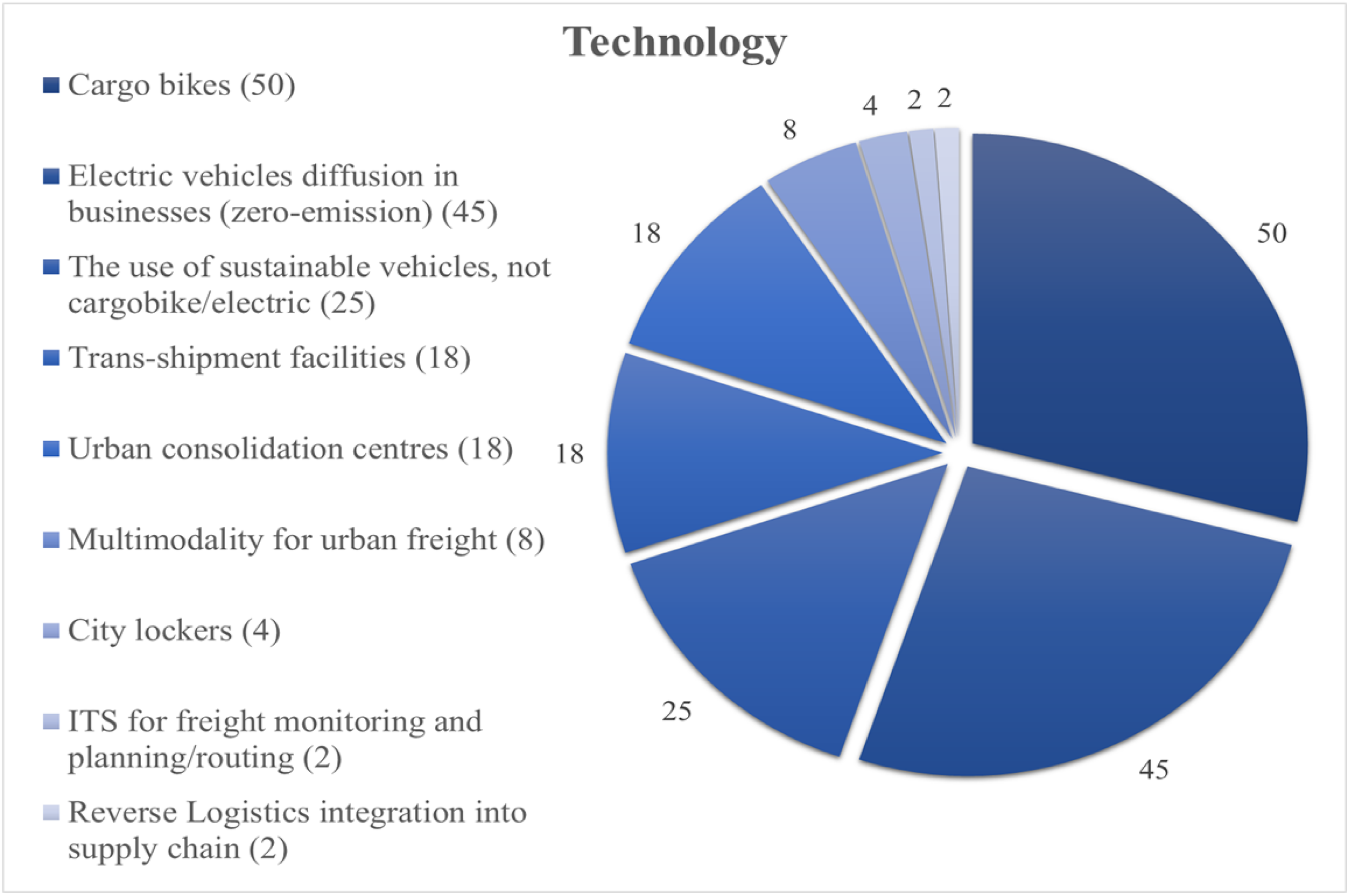


Figure 9 - Outcomes technology domain

7.4.1 Sustainable Vehicles

The codes related to converting vehicles to sustainable alternatives are referred to often in the policy documents. A distinction can be made here between cargo bikes (50), electric vehicles (45) and other sustainable vehicles (25).

Groningen indicates that it wants to work on the delivery method in the city center, which is necessary for the goal to reach zero-emission UFT by 2025. In addition, both the municipality of Groningen and PostNL indicate in the interviews that they are working hard to enable delivery with sustainable vehicles. The municipality of Groningen states that it does this by allowing and assisting sustainable supply projects in the inner city, because they believe that this creates a kind of trust for entrepreneurs to see that it is simply possible to change the mode of transport to sustainable alternatives (Groningen, 2021). In addition, PostNL states that they must comply with the rules within municipalities, i.e. setting up the zero emission zone, but PostNL has also indicated that they want to be a frontrunner in zero-emission transport and therefore want to do more than to adhere to this policy. For example, they are also involved in sustainable transport, which they call city-friendly parcel delivery. Smaller vehicles are used for this, for example cargo bikes, but they also look at slightly larger vehicles, which is the cargo Light Electric Freight

Vehicle (LEVV)(See figure 10) (Interview PostNL, 2021). These LEVVs are currently being tested in a pilot for delivery in the city center of Groningen. During a fieldtrip to PostNL's city hub, they indicated that this project is under development. The current LEVVs and the procedures in the hub are therefore a snapshot, which can change a lot in the coming years (Interview PostNL, 2021). This also applies to other technological developments.

Figure 10 - LEVV in the city hub of Groningen

7.4.2 Trans-shipment facilities

This system of alternative sustainable means of transport is only applicable in the inner city and must therefore be facilitated by centers for repacking parcels outside the inner city. Parcels arrive from large regional centers in the outskirts of the inner city, where they are repacked using sustainable transport methods. This system requires trans-shipment facilities and urban consolidation centers, which are both added 18 times to the policy documents of the municipality of Groningen. In the policy documents it is indicated by the Municipality of Groningen that these hubs are being investigated, but their role in this research process is unclear:

> "*On the edges of the (inner) city, trials are taking place with large and small 'hubs'. Various carriers then deliver their orders here. These orders are bundled and go to residents and shopkeepers in the city center with (electric) freight bicycles, for example*" (p. 4 in Binnenstad Groningen - Ruimte voor jou, 2020).

7.4.3 Other technology measures

In addition, the city locker occur limited in the coding of the policy documents, while in both interviews attention is paid to the city locker. Both interviewees also state that the municipality does not install these lockers, but that this is done by delivery services themselves, and specifically by PostNL.

> "*I am not directly involved in this myself, but we are concerned with installing city lockers*" (Interview PostNL, 2021)

and

> "*City lockers, those are locker walls, PostNL also has a number in Groningen, in which they put the package. This is so they don't have to bring it to your door, but then they put it in a locker and then you can decide for yourself when you take it out*" (Interview Groningen, 2021).

The policy documents hardly mention reverse logistics integration into the supply chain. Returns are mentioned twice and are not forgotten, but exact plans on what they want to do with returns in Groningen is not mentioned in the policy documents. However, within the interview with PostNL reverse logistics integration is mentioned. When PostNL was asked for ideas for the future, it was indicated that interesting possibilities could also be developed with the products at the end consumer. This means that if a consumer has a product that he/she does not want, and that there is a consumer elsewhere who would like to have, it should directly be sent from consumer to consumer. Instead of returning the products first or destroying them (Interview PostNL, 2021). It should be noted here that this is a personal idea and is not yet implemented or researched in the first place.

7.5 Additional findings

In addition to the findings in the policy documents, there are also findings in the interviews that were not mentioned in the policy documents and findings that were not coded in the policy documents.

In the interview with the municipality, for example, it became clear that there are no specific policies for various logistics flows in the municipality of Groningen. The parcel delivery companies must adhere to the same rules as delivery companies, which supply stores. Moreover, PostNL also indicates that the research they are conducting here in Groningen is not specific for the context Groningen, but is also conducted for applying these strategies in other cities in the Benelux, where zero emission zones are also introduced.

> "*So we don't just want to do that in Groningen, but also in other large cities that require sustainable UFT*" (Interview PostNL, 2021)

The municipality of Groningen also stated why the switch to ANPR cameras is being made. They indicated that they had a good idea that the exemption policy is not being properly followed at the moment. Currently enforcement is still taking place with BOAs, but counts have shown that 84% of the traffic drove outside the window times (ie between 12:00 and 21:00) without an exemption, which is illegal. As a result, there is also much more traffic in the city, which actually should not be there.

In addition, the Municipality of Groningen indicates that they generally like collaborations with parties within the field of UFT, but that the collaborating companies are often selected selectively. They often invite 10 to 15 companies and there are always two or three that want to do research in sustainable UFT (interview Groningen, 2021). PostNL is an example of this, because they indicate that they would like to be a frontrunner in sustainable UFT. Moreover, PostNL indicates that:

> "*What you see is that one municipality is further along with the policy on sustainable city logistics than the other. In Groningen you notice very clearly, that they also want to be a leader in city logistics and that is very much in line with the ambition that we also have, so there is relative, if you look at all municipalities, a lot of contact with Groningen*" (interview PostNL, 2021).

What is notable is that the policy measures have to be implemented in practice in the future. However, the policy plans do not contain a description of how this should be done and alternative scenarios, if implementation of the plans are not feasible. In addition, the measures themselves and the to be achieved goals are discussed, but is not mentioned how they investigate whether these goals have actually been achieved.

8. Discussion & Conclusion

8.1 Discussion

It can be concluded that the city of Groningen is investing in an SC strategy, through the implementation of several SM from the NOVELOG (2016) framework.

Most of these planned SM are a part of the governance domain. The governance domain consists of the most codes, so the chance that a quote is a part of the governance domain is larger than the other two domains. However, the individually most applied code is also a code from the governance domain, namely ‘organisational relationships (PPPs)’. Through literature research, it was hypothesized that technology would be the most common domain (Nam & Pardo (2011); Meijer & Bolívar (2016). Thus, the classification of the various domains in Groningen is different than previously expected. Policies in the field of parcel delivery UFT are mainly focused on the governance domain and collaborations and informing all stakeholders are leading in Groningen its policy strategy. The importance of collaborations in an SC is also emphasized in the theoretical framework, making this finding compatible with the character of an SC.

To access the quality of these collaborations, partners must also be interviewed. PostNL indicated that the municipality of Groningen is quite progressive in their vision, and that there is a lot of contact with the municipality, compared to other municipalities. It appears that PostNL is already aiming at making their shipments more sustainable, due to the current climate problems. PostNL has indicated that it wants to be a leader in sustainable logistics with their light electric freight vehicles. As a result, the obligation to drive emission-free in 2015 is not perceived as restrictive by PostNL. These shared sustainability goals improves the cooperation between the PostNL and the municipality, which makes the proposed goals of the municipality more attainable.

It has become apparent that the responsibility for the technological aspects lies mainly with PDS and not with the municipality of Groningen. This explains why the technological domain, in policy documents, is not as large as hypothesised. The municipality develops policies for UFT, after which pilots are allowed in collaboration with PDS. It is expected that these transporters will adjust their mode of transport before 2025, when the inner cities’ zero-emission is put into operation. However, these plans are still under development and pilots are currently executed. This is therefore an ongoing process, which is not yet fixed and thus can still change to a great extent. The policy documents do not contain any plans for what will happen if it turns out in 2025 that completely emission-free driving is not (yet) feasible in the city centre.

In addition, there is no clear and measurable feedback loop for technological developments in the policy documents. Investments can be made in making technological developments measurable, by means of noise and CO2 measurements. If these can measurements are executed as soon as possible, then it will be possible to look at the improvement of the environment in absolute numbers, after the implementation of the chosen SM (2025). This finding also explains the size of the governance domain, as it is currently used as a feedback loop for the implementation of SM. In the municipality of Groningen, there is a high level of collaborations and the opinions of residents are taken into account, regarding the quality of life in the city. With this, Groningen is actually conducting qualitative research into the experiences of stakeholders in the city center of

Groningen. This could be further expanded by integrating a second feedback loop, by means of a quantitative analysis on whether the applied measures actually add to (measurable) sustainability in the city center.

In addition, the municipality has an extensive vision for making the city center emission-free, but outside neighbourhoods are still missing in this vision. The strategy for zero emission with the use of light electric vehicles is primarily applicable on a small scale and shorter distances. Large delivery vans are still preferred over light electric vehicles in larger areas. Thus, in order to apply the zero emission strategy on a larger scale these larger delivery vans need to be driving on electricity or another sustainable fuel.

The policy plans will have major effects on spatial planning in the city center: for example, the effects of zoning in the city center by means of window times and emissions. By allowing only zero-emission vehicles, which now only consist of the small light electric vehicles and cargo bikes, there will be more room for cyclists and walkers.

8.2 Conclusion

After conducting a study into the policy strategies for sustainable UFT in Groningen, it can be concluded that Groningen is investing in multiple SM and various aspects of the SC are planned to be implemented in Groningen in the near future. Because these measures are currently planned, but not yet implemented, there is no visible progress of the SM yet in terms of (measurable) sustainability. As a result, sustainability in parcel delivery UFT in the city of Groningen is theoretically expected to improve, but whether this turns out in practice remains to be seen in the future.

As seen in the results, investments in various SM from the NOVELOG (2016) framework are made in Groningen. Some SM from the framework are referred to more frequent than others. However, the city of Groningen also implements measures, which are not included in the NOVELOG framework, but according to the theoretical framework fit well with an SC strategy. Examples are, ‘access to information’ and ‘surveillance and enforcement’ (see Appendix D). As a result, it can also be concluded that the NOVELOG framework is useful, but lacks for a complete SC strategy.

Moreover, it can be seen that measures from the different domains of the SC are applied in Groningen (governance, people and technology). Of these three different domains, the most information was found regarding the governance domain. The technology domain was the second largest domain, and the people domain the smallest domain. It can therefore be concluded that all domains of the SC strategy can be found in the future policy plans of Groningen and that the city invests in a SC strategy. However, the policy plans do not contain a clear elaboration of alternative scenarios (e.g. what if the zero-emission zone cannot be met by 2025?). In addition, it is unclear how the municipality wants to research whether the measures actually contribute to more sustainability, as supplement to the high level of communication they pursue.

9. Recommendations & Reflection

9.1 Recommendations for future research

Future research can be conducted into an extension and reconsideration of the NOVELOG (2016) framework. An improved framework can be used to conduct a comparative analysis with other case-studies in the future. One way to do this is to compare entire cities, but also the appliance of specific measures within cities. The policy plans in this study have yet to be implemented, it is difficult now to see how well the measures will work in the future and whether they will be properly implemented. After implementation, this is also something to be reflected on in the future. And finally, research can be done into implementation of SM at other scales.

9.2 Reflection

To reflect, I think that the research process has been successful. The theoretical framework provided a good guideline for the research questions and coding schemes, in combination with the NOVELOG(2016) framework. The COVID-19 crisis made electing respondents and conducting interviews (online) more difficult. Nevertheless, two important parties in the city of Groningen were interviewed. However, DHL could have been a valuable addition as the second parcel delivery service in Groningen. This company could not be reached for an interview. In addition, I think that through the policy documents of Groningen good insights have been found in the policies regarding parcel delivery UFT.

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Appendix A *- Interview Guide PostNL*

Before the interview: Has the consent form been completed correctly?

Thank you very much for allowing me to interview you for my Bachelor project. My thesis is about sustainable urban freight transport in Groningen, in which I investigate the current status of sustainability (i.e. whether attention is paid to this or not) and whether this can be improved, by means of the smart city strategy. I have already done preliminary research through a policy document analysis, but I would like some additional information and therefore I chose to do this interview. The interview will be about sustainability in the parcel delivery urban freight transport. So I will often use the word sustainability in my questions, and since sustainability is quite a vague concept, I will first explain what I consider as sustainable for my research. By sustainability I mean the prevention of negative side effect of a certain activity, which have a negative influence on the climate. So in this case, for example the CO2 that is released during the delivery of parcels and mails.

Part 1 - Sustainability policies within company

1. Do you have a sustainability policy in your delivery system?
- If yes, what is this policy?
- If not, why do you not have a sustainability policy?
2. Do you also have technical developments that ensure more sustainability in the delivery system?
- If yes, what kind of technical developments are these?
- If not, why did you choose not to make technical developments?
3. Are employees also trained to act sustainable during their work?
4. Do you also have smart route systems? (so that the most optimal route can be calculated)

Part 2 - Collaboration with the municipality/other parties

5. Do you work together with the municipality of Groningen to create more sustainability within the city of Groningen?
- If yes, what does this collaboration entail?
- If not, why don't you work with the municipality?
6. How do you experience this collaboration?
7. Why is this collaboration experienced this way?
8. Do you have the idea that the achievable sustainability is raised to a higher level through the collaboration with the municipality?
9. Are there certain policy decisions in the municipality that you are very satisfied or dissatisfied with?
- If yes, which one and why do you experience it that way?
- If not, which one and why do you experience it that way?
10. Do you also work with other parties within the city of Groningen?
11. How do you experience this collaboration?
12. Do you have any ideas about the future that will make the city of Groningen more sustainable?

This was the last question I had and I want to thank you again for allowing me to interview you. Are you interested in viewing the transcript?

Appendix B – *Interview Guide Municipality of Groningen*

Before the interview: Has the consent form been completed correctly?

Thank you very much for allowing me to interview you for my Bachelor project. My thesis is about sustainable urban freight transport in Groningen, in which I investigate the current status of sustainability (i.e. whether attention is paid to this or not) and whether this can be improved, by means of the smart city strategy. I have already done preliminary research through a policy document analysis, but I would like some additional information and therefore I chose to do this interview. The interview will be about sustainability in the parcel delivery urban freight transport. So I will often use the word sustainability in my questions, and since sustainability is quite a vague concept, I will first explain what I consider as sustainable for my research. By sustainability I mean the prevention of negative side effect of a certain activity, which have a negative influence on the climate. So in this case, for example the CO2 that is released during the delivery of parcels and mails.

Part 1 - Sustainability within the municipality
1. Is there a specific sustainability policy in the municipality for parcel delivery services?
- If yes, what is this policy?
- If not, why do you not have a specific sustainability policy?

Part 2 - Collaboration with parcel delivery services
1. Do you work together with parcel delivery services or other parties to create more sustainability within the city of Groningen?
- If yes, which services and how does this collaboration work? (do you sit down together to discuss new policy plans?)
- If not, why is there no cooperation between them?
2. How do you experience this collaboration?
3. Why is this collaboration experienced that way?
4. Do you feel that the current policies within the city of Groningen are well followed? (e.g. is enforcement needed?)
5. Do you feel that you are making progress in the field of sustainability with (these collaborations and) the current policies?
- If yes, what kind of progression is this?
- If noy, what do you think could change in the policy or partnerships that would make this the case?
6. Do you ever experience that delivery services find it difficult to comply with the policies in the city?
- If yes, what exactly is the problem?
- If not, does that have to do with the collaboration?
7. Does the municipality have any policy plans that will not be implemented through cooperation with the parcel delivery services, but which will create more sustainability?
8. Do you have any ideas for the future to improve the current policies on sustainable parcel delivery in the municipality of Groningen?

This was the last question I had and I want to thank you again for allowing me to interview you. Are you interested in viewing the transcript?

Appendix C – *Consent Form*

Interview scriptie Aniek Stam
Supervisor: Prof. Dr. L.G. Horlings
Titel: Smart city logistics in Groningen

Geachte deelnemer,

Ik wil u hartelijk bedanken dat u mee wil doen aan dit interview. Dit is het toestemmingsformulier voor mijn bachelor scriptie aan de Universiteit van Groningen. Het doel van deze scriptie is een beter beeld krijgen van het huidige logistieke beleid in de stad Groningen en de samenwerking tussen belanghebbende bedrijven en de overheid.. Het interview zal ongeveer 30 minuten zijn, maar kan als u extra toelichting wenst te geven, ook uitlopen. Daarnaast zal wegens de huidige Covid-19 ontwikkelingen het interview naar uw keuze plaatsvinden, dus fysiek of online (Fysiek: mits geen Covid-19 gerelateerde klachten).

Voorafgaand aan het interview wil ik u informeren over uw rechten voor, tijdens en na het interview. Deelname aan het interview is op vrijwillige basis en als u op een bepaald punt het interview wenst te beëindigen, is dit zonder reden mogelijk. Daarnaast mag u ook een specifieke vraag weigeren te beantwoorden. Het interview wordt opgenomen met een geluidsrecorder en daarna getranscribeerd, zodat deze naderhand geanalyseerd kan worden. De geluidsopname van het interview zal na voltooiing van de scriptie weer verwijderd worden. Het transcript zal niet gedeeld worden in de scriptie zelf, alleen de resultaten. U hebt daarnaast ook het recht om het transcript van uw interview te bekijken en eventuele onjuistheden te verbeteren. Mocht u anoniem willen blijven kan dit uiteraard.

Bij deze bevestigt u uw deelname aan het interview en geïnformeerd te zijn over uw rechten.

Uw naam:…… (wordt alleen voor toestemming gebruikt, niet in de scriptie zelf)

Ik heb de informatie over het interview en de scriptie hierboven gelezen en ben mij bewust van mijn rechten. Ja / Nee

Ik geef toestemming om het interview te gebruiken voor de doeleinden: het schrijven van de scriptie en het geven van een presentatie. Ja / Nee

Ik geef toestemming dat het interview wordt opgenomen en weet dat deze na voltooiing van de scriptie weer verwijderd worden. Ja / Nee

Ik wens anoniem te blijven. Ja / Nee

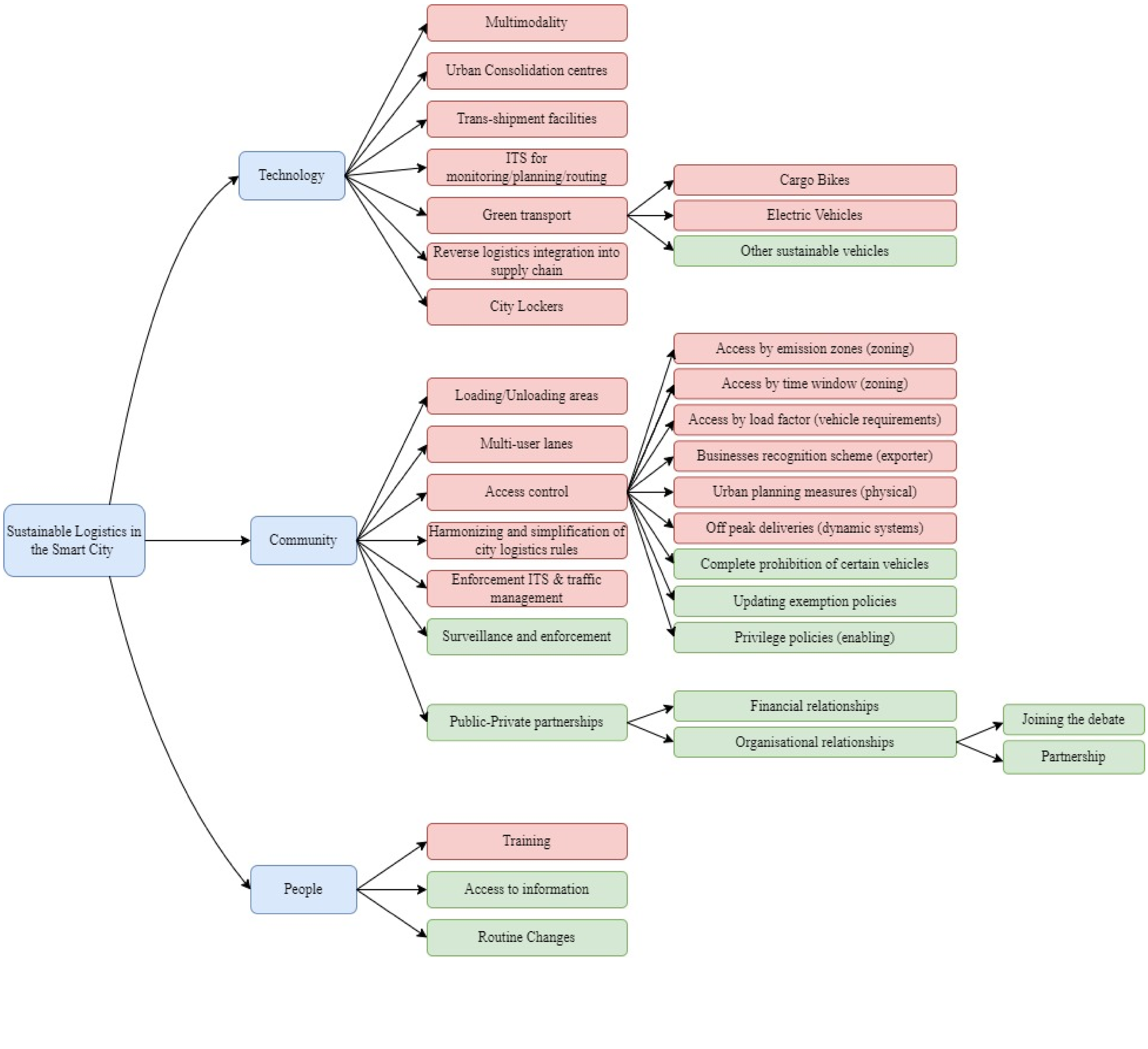
Datum:

Handtekening deelnemer:

Handtekening interviewer:

Appendix D – *Coding Tree*

In the coding tree green codes represent inductive codes and red codes represent deductive codes.



Appendix E – *Policy documents overview table*

Nr.	Name of document	Type of document	Year of publication	Publisher	Information
1	Boekje bestemming binnenstad	Program destination inner city	January 2016	Municipality of Groningen	Plan for sustainable and liveable Smart City Groningen
2	Uitvoeringsprogramma bestemming binnenstad	Execution program destination inner city	May 2016	Binnenstad Groningen-Ruimte voor jou	Plan of execution for the destination inner city program
3	Convenant duurzame stadslogistiek	Covenant	2018	Municipality of Groningen.	Covenant between parties to optimise city logistics
4	Coalitieakkoord gemeente Groningen 2019-2022	Coalition agreement	February 2019	GroenLinks, PvdA, D66 and ChristenUnie	Coalition agreement for the years 2019-2022.
5	Conceptvisie stadslogistiek gemeente Groningen	Concept vision	February 2020	Binnenstad Groningen – ruimte voor jou	Concept vision on future for delivery in the inner city of Groningen
6	Conceptvisie ruimte voor ZES	Vision for Zero Emission City logistics	February 2020	Municipality and elderman Philip Broeksma.	Vision for Zero Emission City logistics in the inner city.
7	Ruimte voor jou visiedocument	Vision document	April 2021	Binnenstad Groningen – ruimte voor jou	Vision on future for delivery in the inner city of Groningen

Appendix F *– Ethical Considerations*

Ethical research is characterized by behaving with integrity, with respect and beneficent (Clifford et al., 2016). In order to act ethically, this thesis adheres to the Dutch code of Conduct for Research Integrity 2018. Main values are therefore honesty, scrupulousness, transparency, independence, and responsibility (KNAW et al., 2018). Therefore, transparency about the intentions, objectives and the process of data collection is assured. The interviewees are informed by means of the consent form and an additional explanation prior to the interview. Thus, interviewees will receive a form of consent, see Appendix C, with information on their rights, such as declining particular questions, remaining anonymous, and the right to withdraw at any time of the interview. Both interviewees indicated that they did not wish to remain anonymous and they are referred to as: Interview and company (e.g. Interview PostNL, 2021). When doing the interviews, it is realised that answers may concern company-sensitive information, which the company would like to keep secret. The information given by the interviewees will only be used in this thesis and not for other purposes. The recordings will therefore be deleted after the thesis has been completed.