



BIKE-SHARING GOVERNANCE IN RURAL MUNICIPALITIES

A research on the governance of bike-sharing in rural municipalities in the northern part of the Netherlands

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Colophon

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Abstract

In rural areas, the public transport systems face increasing pressure to maintain accessibility and meet the needs of local populations. While urban areas have embraced innovative transportation modes, such as bike-sharing, rural areas have generally lagged behind in adopting these solutions. This research explores the potential of bike-sharing as a viable transport option for rural regions, examining its success in urban environments and its applicability to rural settings.

This study focuses on the governance of bike-sharing programs within rural municipalities in the Dutch provinces of Groningen and Drenthe. It aims to answer the research question: *How do municipalities govern bike-sharing in rural areas in the Netherlands, and what lessons can be drawn for future projects?* Through interviews with policymakers, this research provides insights into the challenges and strategies associated with implementing bike-sharing in rural contexts.

The key findings of this research show how bike-sharing systems are governed and developed in rural areas by municipalities. The study reveals that while bike-sharing in these regions is still in the exploratory phase, municipalities recognize its potential to address accessibility issues. Key barriers to bike-sharing in rural areas include low population density, financial sustainability, existing bike ownership, and unfamiliarity with the concept. However, successful examples like the OVfiets and Steenwijkerland networks demonstrate that strategic placement and broad user appeal can enhance the viability of these systems. This can include strategic placement near touristic destinations to increase the group of potential users

For effective implementation, key conditions include adequate financial support, local policymaker ambition, network capacity, and safe cycling infrastructure. Collaboration among municipalities, provinces, and private stakeholders is essential for overcoming challenges and integrating bike-sharing into broader rural mobility strategies.

Key concepts: Bike-sharing, Rural mobility, Accessibility, Governance, Cycling, Mobility Policy

Table of contents

Colophon	1
Abstract	2
Index	5
Chapter 1: Introduction	6
1.1 Background.....	6
1.2 Societal Relevance	6
1.3 Academic Relevance.....	7
1.4 Research aim and research questions.....	8
1.5 Reading Guide	9
Chapter 2: Literature Review	10
2.1 Accessibility	10
2.1.1 What is accessibility?	10
2.1.2 LUTI model	11
2.1.3 Digital components for accessibility.....	12
2.2 Rural accessibility	12
2.2.1 What are rural areas?	12
2.2.2 Rural Accessibility.....	13
2.3 Bike-sharing	14
2.3.1 What is bike-sharing?	14
2.3.2 Bike-sharing as a last mile solution.....	15
2.4 Governing bike-sharing	16
2.4.1 Bike-sharing governance vs public-transport governance.....	16
2.4.2 Strategic level	17
2.4.3 Tactical level.....	17
2.4.4 Operational level	17
2.4.5 Roles authority.....	17
2.5 Conceptual model	18
Chapter 3: Methodology	20
3.1 Research Design	20
3.2 Case Selection	20
3.3 Data Collection	20
3.3.1 Literature Review.....	21
3.3.2 Policy document analysis	21
	3

3.3.3 Media analysis	22
3.3.4 Semi-structured interviews	22
3.3.5 Participant selection	22
3.4 Data Analysis.....	23
3.5 Ethical Considerations	23
Chapter 4: Results	25
4.1 Bike-sharing and accessibility.....	25
4.1.1 Accessibility issues identified by respondents	25
4.1.2 Role of bike-sharing.....	26
4.1.3 Resumé.....	27
4.2 Policies.....	27
4.2.1 National Policies.....	27
4.2.2 Provincial Policies.....	28
4.2.3 Municipal policies	29
4.2.4 Resumé	31
4.3 Success Factors and Barriers for bike-sharing in rural areas	32
4.3.1 Success Factors	32
4.3.2 Barriers	33
4.3.3 Resumé	35
4.4 Conditions for the implementation of bike-sharing in rural areas	36
Chapter 5: Conclusion and Discussion	38
5.1 Conclusions.....	38
5.1.1 Sub-Questions.....	38
5.1.2 Main research question.....	40
5.2 Discussion	40
5.3 Strengths and limitations.....	41
5.4 Recommendations	41
5.5 Reflection on the research process.....	42
Literature	43
Appendix 1: Interview guide (in Dutch)	47
Appendix 2: Codetree	48
Appendix 3: (Policy) Documents analyzed	49

Index

List of Figures

Figure 1: Land use transport interaction cycle (Wegener and Fürst, 1999)	11
Figure 2: Lyons and Davidson (2016)	12
Figure 3: Mosely (1979)	13
Figure 4: Conceptual Model (by author)	Fout! Bladwijzer niet gedefinieerd.

List of Tables

Table 1: List of Interviews	23
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List of abbreviations

BSS	Bike-sharing systems
NS	Nederlandse spoorwegen (Dutch Railways)
KiM	Kennisinstituut voor Mobiliteitsbeleid (Netherlands Institute for Transport Policy Analysis)
MaaS	Mobility as a Service

Chapter 1: Introduction

1.1 Background

In the Netherlands, there is an ongoing challenge to keep rural areas accessible. Already 45 years ago, Moseley (1979) described accessibility as the rural challenge. Current literature shows that forced car ownership and rural livability are still relevant problems (Delbosc and Curry, 2011; Pot, 2023). In rural areas in the Netherlands, there is ongoing pressure on public transport systems, especially on bus connections (Jorritsma, 2023). It is expected that this pressure will continue to do so in the future, and due to this, the already high car dependency of rural areas will only grow further (Jorritsma et al., 2023). Rural municipalities are looking into collaborations and alternative, new forms of transportation to maintain and improve their current accessibility for their inhabitants. However, due to population decline and economic shrinkage maintaining accessibility in rural areas is challenging.

In contrast to this, there are a lot of developments in transport going on in urban areas, such as mode-sharing, autonomous transport, and mobility as a service (MaaS). Next to this, urban areas have become a testing ground for new transport initiatives. For almost every inhabitant, there are usually multiple options to travel to a location and the distances are smaller than in rural areas, both physically and relatively. New initiatives such as shared mobility, MaaS, and mode-sharing have emerged in the Netherlands. There are also local pilots with car-sharing systems. In the northern provinces, Groningen, Friesland, and Drenthe, public transport hubs are developed, which stimulate multi-modality. These hubs combine a traditional bus/train stop with other services. This should make using public transport a more attractive alternative for travelers.

Some of these public transport hubs also provide bike-sharing options. These options are made available by providers such as Dutch Railways (NS), especially at larger stations in urban areas, or other private operators, such as Deelfiets Nederland, Dot, or Go-Sharing. Travelers can rent bicycles for a short period, or longer while paying with a mobile application. This system makes it more attractive and user-friendly to combine modes of travel.

However, there is still a big difference between urban areas and rural areas in accessibility, and also in the service level for these new bike-sharing initiatives. For example, not all rural train stations do have bike-sharing options. However, bike-sharing is getting more popular in the Netherlands. Approximately 10% of the inhabitants of the Netherlands have ever used a shared bicycle (including OVfiets), while 2-6% did use a shared car (Jorritsma, 2021).

Next to these developments, the Dutch government also wants to make transport more sustainable. The government is making policies to shift from fossil fuel to renewable ways of transport. They are promoting public transport as an alternative to cars and the government wants to make the current public transport more sustainable (Rijksoverheid, 2024). Bike-sharing could contribute to increase rural accessibility while it is still sustainable.

1.2 Societal Relevance

Jorritsma et al. (2023) state that there is an ongoing pressure on public transport in rural areas in the Netherlands. The main reasons for this are the decreasing population, the migration of young people to cities, the number of jobs and utilities, and the relatively high car ownership.

Provinces existing out a large number of rural areas do seek alternative transport options, to keep areas livable. Next to this, mobility has a lot of environmental and socio-economic impacts on rural areas and is becoming a more important theme in policies (Goletz et al, 2020).

According to Jorritsma et al. (2023), shared mobility could be part of the solution to these accessibility problems in rural areas. They argue that shared mobility, in combination with a network of public transport hubs, could improve the accessibility of rural areas. Shared mobility in this case could include bike-sharing systems and car-sharing systems. Especially the success of OVfiets, a bike-sharing system shows the potential for bike-sharing in larger areas. Next to this Mohiuddin et al. (2023) added that bike-sharing can enhance transport equity, while it is also a sustainable form of transport. Bike-sharing can decrease the dependence on car use, in urban areas, but also in rural areas.

Both the provinces Groningen and Drenthe mention the improvement of shared mobility, specifically bike-sharing, in their mobility agendas. The province of Groningen wants to make shared mobility widely accessible in the rural regions of the province (Provincie Groningen, 2022). These shared mobility options should become available in public transport hubs. 90% of the public transport hubs in the province of Groningen should have shared mobility options in 2035. Currently, that is below 25% (Provincie Groningen, 2022).

The province of Drenthe is also promoting shared mobility and bike-sharing in its mobility agenda (Provincie Drenthe, 2022). The province wants to increase the number of cyclists, they suggest that bike-sharing could be a means for improving this number. The province suggests that bike-sharing systems should be present at public transport hubs. Drenthe is more specific in their ambitions about bike-sharing: they say that they want to start pilots in bike-sharing on public transport hubs (Provincie Drenthe, 2022). The provinces of Groningen and Drenthe are actively seeking options to include bike-sharing in their mobility plans. This research could give these provinces more insight into how rural municipalities govern, or plan to govern, bike-sharing.

1.3 Academic Relevance

There is much research done on the topic of sustainable mobility, governance, and bike-sharing (Hult et al., 2021, Shaheen et al., 2020). However, little research has been done about bike-sharing governance in rural areas. Bielinski et al. (2021) did research on the usage of shared bicycles. They concluded that bike-sharing is not used as a substitute for cars. However, they found evidence that bike-sharing is used as a substitute for public transport use in Gdansk, Poland. This research was only done in an urban context, the usage of bike-sharing systems in rural areas was not researched.

Hui et al. (2022) researched bike-sharing as a last-mile alternative, in an urban, US context. They described that bike-sharing options could replace public transport in urban areas, but not car use. Next to this, Hui et al. (2022) concluded that the presence of bicycle lanes increases the usage of bike-sharing systems, so infrastructure design plays a role in if people are using bike-sharing systems. Hult et al. (2021) did research on rural accessibility. They focused on Mobility as a Service (MaaS) systems, which bike-sharing systems could be a part of. Next to this, Hult et al. (2021) do not mention the term bike-sharing specifically. Additionally, they are mainly comparing urban and rural MaaS systems, but they do not discuss the topic of bike-sharing governance in rural areas specifically. Hult et al. (2021) concluded that the goals of urban MaaS

initiatives and rural MaaS initiatives are similar, however, rural MaaS initiatives are mostly focused on the accessibility of rural areas. Hult et al. (2021) also concluded that municipalities are considered to play a central role in organizing rural MaaS initiatives, but their involvement was in reality much smaller, due to the existing hierarchy in the Swedish transport network. Cao et al. (2021) did a literature review on bike-sharing. They discussed bike-sharing governance but again focused on urban areas.

The discussion above, relates mostly to international literature about bike-sharing, rural accessibility, and governance. However, all these cases are international examples. There is not much literature found that is focused on the governance of bike-sharing in the northern part of the Netherlands. Some elements of the described literature above could be useful: how do institutions look at each other, and what do actors in the process expect of each other? But this is not described in the (Northern) Netherlands context. Therefore, this research is an addition to the existing literature as it explores bike-sharing in Dutch rural areas from a Dutch governmental perspective.

1.4 Research aim and research questions

Rural areas in the Netherlands do have accessibility issues as car dependency is rising, while public transport services are declining. Bike-sharing could be part of the solution for these problems, however to what degree, it is not clear, in the Dutch context. This research aims to get an understanding of how rural municipalities in the northern part of the Netherlands govern bike-sharing while looking at the opinions of policymakers.

To achieve this aim, the following question is the main research question for this thesis:

- *How do municipalities govern bike sharing in rural areas in the Netherlands, and what lessons can be drawn from that for future projects?*

To support this question, the following questions have been formulated as secondary research questions:

- *SQ1: What is bike sharing and what forms of bike sharing are there?*

This research question gives some context to the subject of this thesis and will be answered in the literature review in Chapter 2.1.

- *SQ2: How can bike sharing contribute to a solution for accessibility issues in rural areas?*

This research question will be answered by both literature and empirical findings in this thesis and the document analysis.

- *SQ3: What current policy is present to encourage bike-sharing in rural areas and what tools do municipalities use to implement that?*

This research question focuses on policies. To answer this research question, empirical data is used, gathered in the interviews with policymakers.

- *SQ4: What are the success factors and barriers for bike-sharing in rural areas?*

This sub-question is also empirical and will be addressed using data from the interviews. To answer this research question, the opinions of policymakers will be analyzed to assess the

success of current bike-sharing systems and to identify the barriers to implementing an effective bike-sharing system

- *SQ5: What conditions should be met for the successful implementation of bike-sharing in rural areas?*

This sub-question will also be answered using empirical data retrieved from the interviews. The aim of this question is to look at the future. Which factors can contribute to designing a bike-sharing system in rural areas?

In answering these research questions, a larger understanding can be developed of how bike-sharing in rural municipalities is created. Next to that, these research questions give an insight into the considerations rural municipalities could make in developing policies for bike-sharing.

1.5 Reading Guide

This thesis is structured as follows. This chapter introduces the main research topic, the societal and academic relevance of this study, and the research questions. Chapter 2 elaborates further on the topic and provides relevant theories to this research. Concepts such as bike sharing, accessibility, and governance are discussed. After that, the discussed theories are summarized in a conceptual model. In chapter 3 the methodology of this thesis is presented. In Chapter 4 the results of this research are presented while in Chapter 5 the discussion and conclusion are presented. Lastly, the references and appendices are shown.

Chapter 2: Literature Review

The purpose of this chapter is to discuss various literature that is relevant for this thesis. First, the concept of accessibility will be introduced, after that the land use transport interaction cycle is discussed. The full cycle is shown, however the focus of this thesis is on the supply side for rural accessibility and bike sharing. After the LUTI cycle, the concepts of rurality and rural accessibility are discussed. After that the concept of bike-sharing is discovered. In this section, the first sub-question will be discussed. This section is followed by a section that discusses how bike-sharing can be governed. Finally, a conceptual model is shown in 2.5.

2.1 Accessibility

2.1.1 What is accessibility?

Accessibility is a key component for increasing and maintaining the livability of rural areas (Jorritsma et al., 2023). There have been multiple definitions for accessibility. One of the first definitions of accessibility was made by Hansen (1959). He defines accessibility as the potential of opportunities for interaction. Bike-sharing is a new aspect of mobility, which could add a new option for accessibility. According to Vitatale Brovarone and Cotella (2020), rural areas need to increase mobility options to increase the accessibility of an area. In this subchapter, the term accessibility is explored. Multiple theories will be discussed, where the importance of accessibility in relation to rural areas and bike-sharing will be explained.

In relation to transport geography and planning the definition by Geurs and van Wee (2004) is applicable because this definition includes multiple forms of transport. They define accessibility as “*the extent to which land-use and transport systems enable people to reach activities or destinations by means of a (combination of) transport mode(s)*” (Geurs and van Wee, 2004, p.128). They see accessibility measures as indicators for land use developments and policy plans. They identify four components in their definition.

1. The land use component: This component reflects the land use system. It consists of the amount, quality, and spatial distribution opportunities supplied at each destination, the demand for these opportunities at origin locations, and the confrontation of supply and demand for opportunities
2. The transportation component: This is described as the disutility for individuals to cover distances between the origin and the destination using a specific transport mode.
3. The temporal component: this component reflects the availability of opportunities to visit destinations or origins at different times of the day.
4. The individual component: this component reflects the needs, abilities, opportunities, and the travel budget of individuals to reach transport.

These components are also useful for this research. The land use describes the number of opportunities for transport. In rural areas, the number of opportunities will be lower than in urban areas, therefore the number of possibilities for a bike-sharing system will decrease.

In the transportation component, most accessibility models focus on one mode, however, multi-modal models have increased in popularity among researchers. Geurs and van Wee (2004) conclude that accessibility affects the land use and transport changes. This is in line with Wegener and Fürst (1999). They explained that throughout the history, cities emerged at

locations with a high potential, for example at locations where multiple trade routes merged or at coasts.

2.1.2 LUTI model

Wegener and Fürst (1999) made the land-use transport interaction cycle to explain the relationships between accessibility and land use, shown in Figure 1. In this land use transport cycle (LUTI), Wegener and Fürst (1999) distinguish four components. These components are interlinked in a cycle and therefore one can start anywhere in the cycle. The four components are:

- Land use: the distribution of land uses such as residential, industrial, or commercial determines the locations of human activities (living, working, leisure).
- Activities: the distribution of activities that require spatial interactions or trips in the transport system to overcome the distance between the locations of activities
- Transport system: the distribution of infrastructure in the transport system creates opportunities for spatial interaction and can be measured as accessibility
- Accessibility: the distribution of accessibility co-determines location decisions and results in changes in land use.

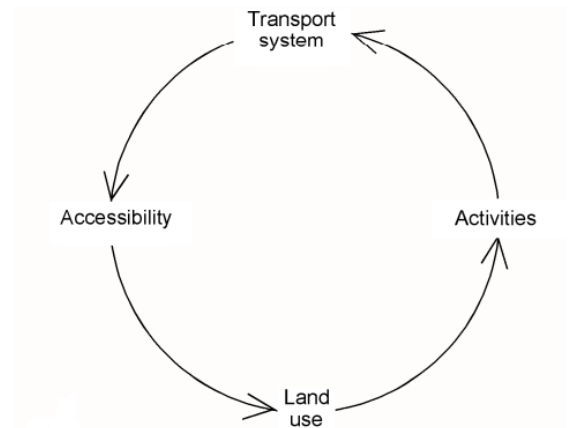


Figure 1: Land use transport interaction cycle (Wegener and Fürst, 1999)

This land-use transport interaction (LUTI) cycle can be valuable for bike-sharing systems. For the land use component. The distribution of residential, commercial, and leisure spaces influences the locations where people need to travel. In rural areas, this dispersion often leads to car dependency due to the lack of public transport. A bike-sharing system can serve as an alternative, filling the gap for last-mile transport, and connecting these land-use locations with transport hubs (Shaheen et al., 2010) Next to this, for the distribution of activities, bike-sharing systems provide a flexible mode of transport that allows individuals to overcome distances between activity locations, particularly in rural settings where public transit is sparse. For example, people might use shared bikes to travel between home, public transit hubs, and leisure destinations, improving access to these dispersed locations (Ricci, 2015). In the next parts of this chapter, the focus is on the supply part of cycling in the LUTI cycle.

2.1.3 Digital components for accessibility

Recently a new factor was added next to physical mobility (accessibility) and land use. Lyons and Davidson (2016) propose digital connectivity, next to land use and connectivity as a third factor of accessibility. This has become more relevant, especially since the COVID-19 pandemic when working from home became more common. These relationships are shown in the triple access system in the article of Lyons and Davidson (2016), which is shown in Figure 2. The model shows that accessibility is influenced by spatial proximity, physical mobility, and digital connectivity. Spatial proximity is measured by the land use system, physical mobility is measured by the transport system, and digital connectivity is measured by the telecommunications system.

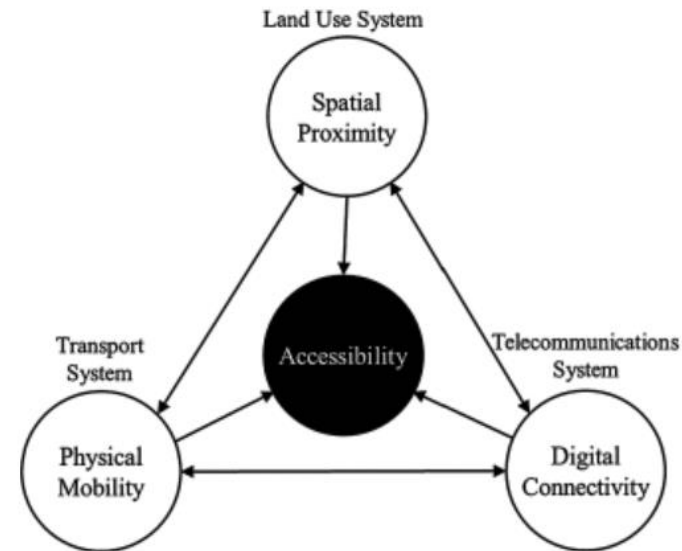


Figure 2: Lyons and Davidson (2016)

According to Shaheen and Chan (2016), GPS and digital means are crucial for accessing shared mobility options, making digital connectivity an essential aspect of this research. Most shared mobility options rely heavily on digital components for various functions. For instance, ride-sharing requires digital platforms for users to connect, and bike-sharing and car-sharing necessitate mobile applications for reserving vehicles. The effectiveness of these shared mobility options is significantly limited if the telecommunications infrastructure is inadequate.

Shaheen and Chan (2016) also highlight the need for geofencing in free-floating bike-sharing, which underscores the importance of the digital component in ensuring accessibility. Information and Communication Technology (ICT) is reshaping personal mobility through the development of mobility apps, which are vital for trip planning. Shaheen et al. (2020) mention that the role of trip-planning apps is further elaborated, distinguishing between single-mode and multi-mode trip-planning apps. These technologies enable and enhance shared mobility by integrating various transportation modes into a seamless user experience.

2.2 Rural accessibility

In this thesis, the word 'rural' is used in the research question. But what exactly are rural areas? And what are the current accessibility challenges in rural areas? This subchapter will elaborate on that. First, the term rural areas will be explained and after that, there will be an elaboration on the current challenges in rural accessibility.

2.2.1 What are rural areas?

There are multiple definitions for the term rural and organizations use different classifications. In this section, the term 'rural' is explored and a definition will be shown that is used in this thesis. According to the OECD typology, there are no rural areas in the Netherlands (OECD, 2012). The report distinguishes four categories: predominantly urban, intermediate, predominantly rural close to a city, and predominantly rural remote. The OECD report classifies most parts of the Netherlands as 'predominantly urban' (all provinces except Groningen, Friesland, Drenthe, and Flevoland), and 'intermediate' (Groningen, Friesland, Drenthe, Flevoland). However, the KiM policy report (Jorritsma et al., 2023) about mobility in the Netherlands shows a difference between urban and rural areas. They classify rural areas as 'areas

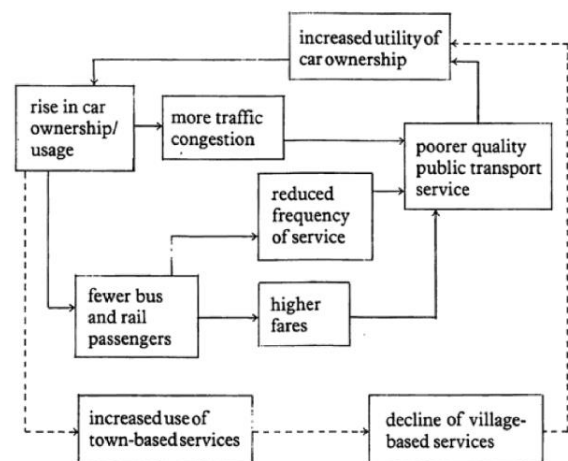
with less than 1000 addresses per km² (Jorritsma et al., 2023). Next to that, Haartsen et al. (2003) did a questionnaire among inhabitants of the Netherlands about what areas they perceive as rural. The outcome shows a clear difference between urban and rural areas in the Netherlands. Most people perceived the provinces of Groningen, Friesland and Drenthe as rural, and other parts of the Netherlands as not-rural. Another conclusion of Haartsen et al. (2003) is that agricultural areas are mostly perceived as rural.

Woods (2005) uses another definition of rural areas. According to Woods (2005), rural areas are social constructs. This means that there are no strict boundaries between rural and urban areas. Next to this, there is always a connection between rural and urban areas, especially in an urbanized country as the Netherlands.

In this thesis, the definitions made by Jorritsma et al. (2023) and Woods (2005) are used: rural areas are areas with less than 1000 addresses per km². Next to that, these areas must be perceived as rural by its inhabitants as rural and are mostly agricultural areas. These definitions are suitable for the Dutch context.

2.2.2 Rural Accessibility

Different areas have different levels of accessibility. However, this can be 'relative'. There can be differences between rural and urban areas, however, some rural areas may be more accessible than some urban areas, such as industrial areas within a city that lack public transport and are only accessible by car, bike, or foot. The perception of accessibility also differs per region. People in urban areas tend to experience a higher accessibility than people living in rural areas. However, Jorritsma et al. (2023) in the KiM report concluded that there are no significant differences in perceived accessibility between people living in urban areas and people in rural areas. Jorritsma et al. (2023) argue that this can be caused by compensations that people make, to make their home accessible, such as a good internet connection, social skills to pursue, for example, an elevator in their house when people elderly or disabled, or enough money to buy a car. This can be both the financial ability to buy a car or the ability to get a lift from other people. These individual factors can contribute to the perceived accessibility of a place. However, these compensational factors may not apply to weaker groups. Pot et al. (2023) argue that this is because people move to rural areas for reasons of self-selection. This means that they take a lower accessibility for granted because they choose to live in a rural area. According to Pot et al. (2023), the main compensation factor in self-selection is car mobility. However, this can be problematic for people who have not access to a car. Pot et al. (2023) argue that people living in rural areas appear to have lower expectations than those living in urban areas. Camarero and Oliva (2019) argue that the demand for mobility in rural areas is higher than that in urban areas. This is because in rural areas larger distances have to be covered. Next to this, they argue that there is a lack of (public) transport in rural areas. Another reason is that the demographic composition of rural areas is weak, due to an aging population. This is not in line with the conclusions of Jorritsma et al. (2023).



However, Moseley (1979) named rural accessibility as ‘the rural challenge’. He describes in his book the downward spiral of rural accessibility. In the spiral, due to increased car ownership and car dependency, the accessibility to public transport is decreasing. However his model simplifies reality, it is still very relevant and useful. It describes the decline of rural communities. The model is still relevant, even after more than 40 years of publishing. The main challenge in rural areas is to break the cycle of the model and make public transport more feasible for rural inhabitants.

Multiple authors seek to solve this challenge.

Figure 3: The rural challenge (Moseley, 1979)

Vitale Brovarone and Cotello (2020) conclude

in their paper that rules and procedures, according to them, two key components of accessibility, should be more flexible in rural areas. This could enable alternative transport options, such as shared mobility and other MaaS options. However, they argue that this process is very complex. According to Vitale Brovarone and Cotello (2020), local governments have limited influence in the decision-making and the governance of mobility. This is mostly influenced by higher governments (national, provincial). In most cases, local rural governments are too small to make a system-changing decision.

One of these solutions can be the multi-modal transport hubs. For example, in the Northern provinces of the Netherlands, these hubs are managed by an intergovernmental program, the hub program. This is a collaboration between the provinces of Groningen, Drenthe, and the local transport authority (ReisviaHub, 2024). According to Rongen et al. (2022), rural hubs may offer a more cost-efficient way for transport companies to connect low-density areas with cities. Next to this, rural hubs can also improve the livability of a rural area because hub-generated traffic can strengthen the viability of facilities in rural areas with both population decline and economic decline.

2.3 Bike-sharing

2.3.1 What is bike-sharing?

Shared mobility is the shared use of a bike, car, motor, or other vehicle on an as-needed basis (Shaheen and Chan, 2016). The concept has become popular in the past decades, however, it is far from new. There have been bike-sharing initiatives present in the Netherlands since the 1960s (Shaheen et al., 2011). Approximately 10% of the inhabitants of the Netherlands is a regular user of a shared bicycle (Jorritsma et al., 2021). They mostly use these bikes for short distances in urban areas. The average distance made by a shared bicycle is 2,1 km in the Netherlands (Jorritsma et al., 2021). Bike-sharing initiatives include both electric bicycles and traditional, non-electrical bikes. Campbell et al. (2016) state that in bike-sharing systems that consist of e-bikes, the covered distances by users are larger than that in bike-sharing systems consisting of traditional, non-electric bikes. They also suggest that a bike-sharing system that consists out of e-bikes attracts a different demographic. Plazier et al. (2023) state that a potential user group for e-bikes can be people with a low education and a low income. This could make e-bikes more suitable for rural areas.

Shaheen and Chan (2016) first make a distinction between providers of bike-sharing systems. These providers are divided into three categories of bike-sharing systems (BSS): Public bike-sharing, closed campus bike-sharing, and people-to-people (P2P) bike-sharing. In a public bike-sharing system every person can use the bikes. In a closed campus bike-sharing system, only certified users, such as employees of a company or students of a university are able to use the

bike-sharing system. In a P2P bike-sharing system, bike owners can rent out their own bikes to other people in the area. This thesis focuses on public bike-sharing, as this is the largest system and the most relevant for last-mile transportation, as bike-sharing options are currently present on major train stations and public transport hubs. Next to this, public bike-sharing is the most present in the Netherlands.

Shaheen et al. (2020) identify three models of public bike-sharing. The first model is station-based bike sharing. In this model, the bicycles are attached to a specific station. At this station, users can rent the bicycle and these users have to return the bicycle to the same location (back to one), or another of the assigned stations (back to many). A Dutch example for this is the OVfiets, which can be rented at train stations and have to be returned to the same station (back to one). The OVfiets was developed by an innovation team of ProRail (Ploeger, 2024). This team linked IT-technology, such as the OV-chipkaart to the rental system and developed accessible, shatterproof bikes. Ploeger (2024) explains various factors why the OVfiets is successful. He argues that the OVfiets is successful of its simple, accessible design, its user-friendly payment system (OV-chipkaart) and governmental support. Another Dutch example of a station-based bike-sharing network is Veluwe Deelfiets (Veluwe Deelfiets, 2023), an example made possible by local entrepreneurs where users can rent a bike at a station and return it to another station (back to many).

The second model Shaheen et al. (2020) identify is dockless bike-sharing. In this model, stations are not needed to rent and park a bike. Users can pick up a bike anywhere on the street and park it wherever they want within a predefined area. Examples of this are Go-Sharing bikes, located in various Dutch cities.

The third system Shaheen et al. (2020) identify is hybrid bike-sharing. This model combines both station-based bike-sharing systems and dockless bike-sharing systems. In this mode, users can rent a bicycle at a station or a non-station location and return it at both a station and a non-station location somewhere on the street in the predefined area.

Each model has its advantages and disadvantages. Station-based bike-sharing systems are not flexible. Users have to return the bikes to certain points. The OVfiets, for example, have to be handed in at stations where employees check the bikes. This makes the system manageable, but it is less flexible for users (Rijkswaterstaat, 2023). Free-floating bike-sharing systems are more flexible because the bikes can be parked everywhere – within designated areas. However, free-floating bike-sharing systems can cause an environmental nuisance, which can be difficult for the government to control (Rijkswaterstaat, 2023).

2.3.2 Bike-sharing as a last mile solution

Pot et al. (2023) state that rural areas are mostly dependent on car use for accessibility. However, they state that people who do not have access to a car, might have problems to reach rural destinations. A possible solution for this, can be bike-sharing. Bike-sharing systems are used for various reasons. They are used for short trips in a city, but also as a way to cover the last mile of a multimodal trip (Bielinski et al., 2021) and also by tourists for longer (day)trips (Visit Weerribben, 2024). Evidence from Helsinki shows that the presence of a bike-sharing system can reduce the travel time for public transport (Jäppinen et al., 2013). They showed evidence that especially while traveling in the suburbs of a city, the travel time is reduced the most. These results suggest that a large-scale BSS can be complementary to a public transport system in an urban area. Next to that, this means that a BSS can improve the accessibility of the whole urban

area because in high-density city centers the accessibility is already high while in sub-urban parts of (European) cities, the density is lower. Jäppinen et al. (2013) recommend that a BSS should be seen as part of a public transport system rather than a cycling system.

However, multimodality is less common in rural areas (Kask et al., 2021). This is because rural areas have a wider catchment area and thus longer travel times and distances in the last mile. Next to this, there is less public transport in rural areas, and the lines that are there have a lower frequency. This makes it less attractive for travelers to choose to combine transport modes to reach their destination. This is one of the reasons that rural areas have a higher dependency on cars. Because of the larger distances, public transport users have fewer options to reach their final (rural) destination.

2.4 Governing bike-sharing

2.4.1 Bike-sharing governance vs public-transport governance

Little research has yet been done about the governance of shared mobility in rural areas. Hult et al. (2014) researched MaaS governance, but this was not focused exclusively on bike-sharing. Next to this, Rongen et al. (2020) did research on the hub programs in the northern part of the Netherlands, but it is mostly focused on defining hubs and how to govern these multi-modal hubs. However, extensive research is done about the governance and organization of public transport in both urban and rural areas. In this chapter, the framework of Van de Velde (1999) about the organizational forms of public transport is used to explain the organization of shared mobility. In his framework, Van de Velde (1999) distinguishes three levels of organization for public transport. The first level is the strategic level. At the strategic level, the general transport policies are explained. At this level, the focus is on policy goals for public transport and profitability and market share. The strategic level focuses on longer periods of time, it includes periods from 1-5 years. The second level in the framework of Van de Velde (1999) is the tactical level. At this level the main question is which services can help to achieve the transport aims stated at the strategic level. At this level, multiple policy instruments are explained that can help to achieve the strategic goals. Examples of policy instruments at this level are transport subsidies to concessions. At this level, the focus is on detailed service characteristics as fares, routes, the timetable, and other services. This level is mostly focused on medium-term time periods, ranging from 1-2 years. The third level in the framework is the operational level (Van de Velde, 1999). This level focuses on the production of public transport services to the public. This level includes the sale of the product to customers, infrastructure management, vehicle rostering and maintenance, and personnel rostering. This level is mostly focused on short-term time periods, ranging from 1-6 months.

Next to this, Van de Velde (1999) makes a distinction in his framework to classify forms of public transport. The first distinction is between authority initiative and market initiative. In 'authority initiative' the transport authority has the legal monopoly to provide transport services to an area. In the market initiative, multiple parties can offer transport services to customers. In the market initiative, Van der Velde (1999) makes a distinction between competition on the road and competition off the road. With competition on the road, operators can develop services as they like. With competition off the road, operators are bend to a set of rules and regulations which they have to follow. In the Netherlands, most times a combination of market-led and government led public transport is used with the current public transport concessions.

2.4.2 Strategic level

At the strategic level of public transport organizations, the aim is to define policies. At this level, the main question is *'What do we want to achieve?' (Van de Velde, 1999)*. At this level, the main characteristics of the provided transport services will be decided. For public transport, this will include the tactical decisions. In the Netherlands, the decisions on the strategic level are mainly made by transport authorities in collaboration with the national government. There are two major models in Dutch public transport: substantial freedom for the operator (1) and service design by the authority (2) (Van de Velde et al., 2008). In the substantial freedom model, the service is designed by the operator. The operator has the freedom to design their own services with limited interference of overlooking national or provincial authorities. At this level, the main service is awarded to a provider based on the quality of the of the plans. It includes a high bonus/reward system based on the quality of the provided plans. However, the revenue risks are completely are completely for the provider. In the design-by-authority model, the overlooking authorities provide the frameworks and network designs for the public transport systems. The provider has to execute the plans. In this model, the revenue risks are shared between the transport authority and the operator (Van de Velde et al., 2008). This model is, for example, used for the public transport concession Groningen/Drenthe with the OVBureau. The main difference between the model is the level of control, governments can choose to outsource parts of the design to different parties, but they can also choose to maintain control. However, also combinations of both models can be used.

2.4.3 Tactical level

In the tactical level of public transport organizations, tactical decisions are made for acquiring means that can help to reach the general aims designed at the strategic level. Next to this, on the tactical level, it is decided how this means can be used most efficiently. The main question Van der Velde (1999) states for this level is: *what product can help us to achieve the aims?* The tactical level translates the main policy aims at the strategic level into detailed service characteristics. According to van der Velde (1999), the actual design of transport services is at this level. The definition of the routes, timetables, vehicles, and fares take place at this level. On the tactical level, there are mostly decisions made by the transport authority or a local government. Next to this, other aspects of services related to public transport are on this level, for example, catering, news provision, and other additional services (Van der Velde, 1999).

2.4.4 Operational level

At this level, transport organizations make sure that orders are carried out, and that it happens efficiently. The main question on this level is: *How do we produce the product?* At the operational level is the translation between the tactical aspects into day-to-day practice (Van der Velde, 1999). At this level, the management of staff, vehicles, but also infrastructure is included. In the Netherlands, most contracts at the operational level are done by private companies. In some market models, for example, a free competition model, operational providers have tactical powers (Van der Velde, 1999).

2.4.5 Roles authority

In discussing the roles of transport authorities, it is essential to understand the various governance models and their implications for transportation services. Van der Velde (1999) identifies several governance models, ranging from full control to free-market approaches, each with its distinct impact on transportation systems.

Under a full-control model, transport authorities exert comprehensive oversight over transportation services. They are responsible for dictating routes, schedules, and fares, and may even operate services directly. This approach ensures a high level of uniformity and quality across the system. However, it can also restrict innovation and limit the system's responsiveness to market changes (Van der Velde, 1999). This model, while ensuring consistency, may struggle to adapt quickly to evolving needs and technological advancements.

In contrast, a semi-regulated approach offers a more balanced framework. Authorities set standards and guidelines but allow operators some flexibility in how they deliver services. This model fosters competition and innovation by giving operators room to experiment and improve, while still maintaining a focus on public interest objectives such as accessibility and affordability (Fietsberaad, 2014). The semi-regulated model thus aims to combine the benefits of regulation with the advantages of operational flexibility.

The free-market model minimizes regulatory intervention, relying on market forces to determine service provision. Operators have significant freedom to set routes, pricing, and service levels. This approach promotes entrepreneurial initiatives and operational efficiency. However, it may also lead to concerns about equity, service quality, and coverage in less profitable or underserved areas (Van der Velde, 1999). The challenge here is balancing the efficiency gains with the need to ensure equitable service for all users.

These governance models are not limited to traditional public transport but also apply to emerging shared mobility services such as bike-sharing and ride-sharing. Veeneman and Van der Velde (2014) mention that these services often require subsidies and supportive regulatory frameworks to succeed, particularly in urban environments. The role of authorities is crucial in creating an environment that supports these new mobility options, aiming to reduce congestion and promote sustainable transportation.

Next to this, Hult et al. (2014) highlight that successful MaaS systems, which can include bike-sharing, rely on the involvement of ambassadors and facilitators, and are typically financed by various forms of government—whether national, local, or public transport authorities. Notably, these systems are generally initiated by higher levels of government rather than local municipalities, indicating a need for substantial external support to establish and sustain these services.

2.5 Conceptual model

In Figure 1 the conceptual model for this thesis is shown, which visually represents the interrelationships among various variables and theories discussed in the preceding sections. This model is designed to offer a framework for understanding the governance and effectiveness of bike-sharing systems in rural areas.

The model incorporates the governance levels articulated by Van der Velde (1999), which are categorized into strategic, tactical, and operational levels. These levels are crucial in understanding how bike-sharing initiatives are managed and implemented:

1. **Strategic Level:** This highest level involves overarching decision-making processes undertaken by governments, large transport authorities, and other major stakeholders. It encompasses policy development, funding decisions, and the creation of broad

frameworks that guide bike-sharing strategies. The main player on the strategic level is mainly the national government.

2. **Tactical Level:** At this intermediate level, provincial and municipal governments, and local transport authorities play a pivotal role. They are responsible for translating strategic policies into actionable plans, developing regional bike-sharing networks, and coordinating with municipalities to ensure alignment with broader objectives, for instance regional and local planning policies regarding accessibility.
3. **Operational Level:** The operational level involves the day-to-day management and execution of bike-sharing programs. This includes the roles of local transport providers, and bike-sharing companies in implementing, maintaining, and operating bike-sharing systems on a practical level.

The model also addresses the current status of bike-sharing systems, reflecting how the decision-making processes at these various levels impact the deployment and effectiveness of such programs. The existence and quality of bike-sharing services are contingent upon the decision-making and policy frameworks established at these levels. Next to this, potential success factors, barriers and conditions for bike-sharing in rural areas are included in the model. It is important for governments to identify these factors, as they are crucial for implementing a successful bike-sharing network. The outcome of this conceptual model is the enhancement of accessibility in rural areas through effective bike-sharing systems.

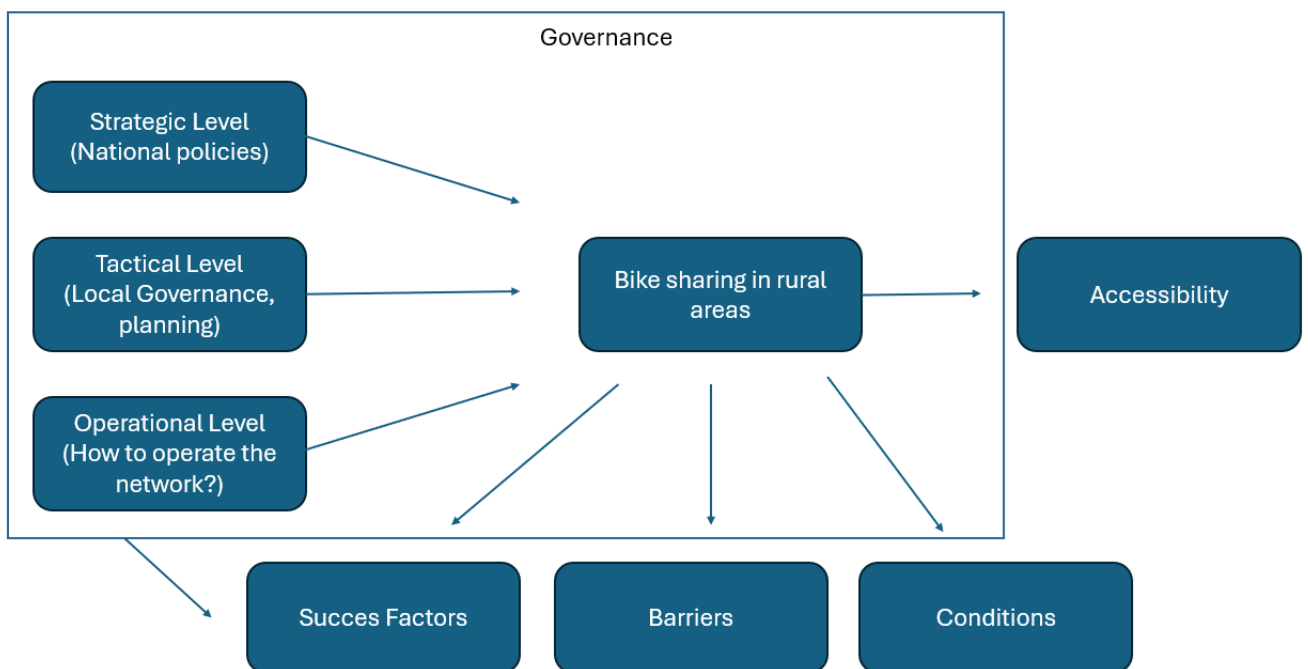


Figure 4: Conceptual Model (by author)

Chapter 3: Methodology

The purpose of this chapter is to discuss the research methods used for this thesis. In section 3.1 elaborates on the research design for this thesis. Section 3.2 elaborates on the case selection, while in section 3.3 the various methods of data collection are described. Section 3.4 elaborates on the data analysis and section 3.5 reflects on ethical considerations for this thesis.

3.1 Research Design

For this thesis, there is chosen for a qualitative research method considering the goal for this research, which is to explore how governing bike-sharing works in reality. To research this, a qualitative method is the most suitable, because interviews can be used to explore 'how' and 'why' issues relevant to this study, and describe the experiences of policymakers (Clifford et al., 2010). According to Clifford et al. (2010), qualitative research methods focus on the experiences of humans. Because this study is about the opinions and experiences of policymakers about bike-sharing, a qualitative approach is considered most relevant for this study. The research design of this thesis consists of a theoretical part and an empirical part. For the theoretical part the literature review has been conducted that which results are reported in Chapter 2. The empirical part consists of an analysis of documents and semi-structured interviews. The findings are reported in Chapter 4.

3.2 Case Selection

The geographical focus of this thesis is the Northern part of the Netherlands. This area has been chosen because of the rurality of the most of its area, and because of the decline in public services (Jorritsma, 2023). Within the area, municipalities of interest have been selected by the following criteria: is the municipality rural and are there current or future policies about shared mobility. To measure the rurality of the municipalities, data from Jorritsma et al. (2023) is used. Jorritsma et al. (2023) classify regions into four categories: 'urban with population growth', 'urban with population decline', 'rural with population growth', and 'rural with population decline'. Municipalities were selected in the classifications rural with population growth and rural with population decline. For this reason, the municipalities of Groningen, Leeuwarden, Assen, and Emmen are excluded from this research, as these municipalities are mostly urban (Jorritsma et al., 2023), and shared mobility is in some form already present. After this, a selection was made of municipalities that have some form of bike-sharing or have ambitions to make policies about bike-sharing and are located in rural areas. Next to that, municipalities are partly selected on convenience: in some municipalities, the relevant policymaker was unavailable for an interview or did not reply after reaching out. The following five municipalities have been selected for interviews: Aa en Hunze, Midden-Drenthe, Noordenveld, Westerkwartier, and Westerveld. These municipalities form a contiguous area in the provinces of Groningen and Drenthe.

3.3 Data Collection

For this thesis, three kinds of data have been collected. First, a literature review was done to get a deeper insight in the topic of bike-sharing and governance, to scan the current relevant theories about bike-sharing, newer forms of mobility, and transport governance, and to provide a framework for the qualitative research. Next to that, a document analysis was conducted to get more insight into current policies and trends in the topic of bike-sharing in rural areas. Finally,

semi-structured interviews have been conducted to get a detailed insight into the policies of bike-sharing of the chosen municipalities. This section elaborates on the chosen methods and the participant selection.

3.3.1 Literature Review

In Chapter 2, the reviewed literature has been discussed. The literature review consists of relevant identified concepts and theories. For the literature review various keywords related to the research topic have been used, such as: bike-sharing, accessibility, governance, and other relevant theories. Based on the literature review, a conceptual model is created where connections between various literature are shown. This conceptual model and the literature review are used to make the interview guide and the deductive code tree which is used to analyze the empirical data collected during the semi-structured interviews.

For this research, multiple articles are used. To find these articles, various ways of searching are used: Google Scholar, Smartcat, and Scopus. Next to this, snowballing from references is used to find more relevant articles. There was searched on the following keywords: shared mobility, bike-sharing, bike-sharing governance, rural mobility, public transport governance, accessibility, and rural accessibility.

3.3.2 Policy document analysis

Next to the literature review, a policy document analysis was conducted to understand what policies are already there for bike-sharing in rural areas. According to Bowen (2009), document analysis is a systematic procedure for reviewing or evaluating documents. Bowen (2009) mentioned that a document analysis is particularly useful in a qualitative research approach. The aim of the policy document analysis for this thesis is to get a better understanding of policies related to mobility, cycling, and bike-sharing in the areas under study. Next to this, the policy document analysis formed also as a basis for the preparation for the semi-structured interviews (see section 3.3.3). In this policy document analysis, several policy documents have been analyzed. This analysis includes policy documents made by local municipalities and provinces.

The following criteria are used in selecting the policy documents:

1. The policy document describes policies in the research area (municipal, provincial, national)
or
2. The policy document describes trends, national laws, and regulations about bike-sharing or

The used policy documents are found via searches at the websites of the organizations. For some policy documents, Google is used to find the document. Searches have been done on the terms 'mobility', 'shared mobility', and 'bike-sharing' in combination with policy and the name of the organization. After that, snowballing is used to find more policy documents, also via the suggestion of the respondents. To be included, the document had to:

1. Address the mobility policies of the research area
and/or
2. Be the most recent policy document of the municipality/province.

The (policy) documents that are used for the document analysis are shown in Appendix 3.

3.3.3 Media analysis

For preparing the interviews, a brief media analysis was conducted alongside the literature review and policy document analysis. This media analysis involved screening local news articles focusing on bike-sharing, specifically targeting those relevant to the selected municipalities. Articles were chosen based on both location and the subject, ensuring they addressed bike-sharing or other pertinent mobility issues in the areas of interest. It is important to note that this media analysis was conducted solely as preparation for the semi-structured interviews, the news articles are not included in the results section.

3.3.4 Semi-structured interviews

In addition to the methods described above, semi-structured interviews were conducted. According to Longhurst (2010), interviews are used by a researcher to elicit information from another person. Semi-structured interviews are more conversational and allow an open response from the participant and were considered relevant for this more explorative study. This allowed me as the interviewer to have an open, informal conversation with the participant and with this, more in-depth information could be gathered in comparison with questionnaires and structured interviews. For the semi-structured interviews, various interview guides were made, dependent on the specificities of the participants. The main interview guide that formed the basis for the interviews is shown in the appendix. This interview guide was based on the literature review and the conceptual model. Various literature was used to make the interview questions. Next to the interview guide, Longhurst (2010) suggests that additional preparation is needed for semi-structured interviews. This is met in this study by additionally preparing for the interview through: policy documents that were read and local news articles that were viewed, to stay fully updated on the subject in the area.

3.3.5 Participant selection

Participants were selected on their knowledge of the research subject and their employment at municipalities and provinces in the research area, by purposive sampling. With this, participants are selected because of their knowledge and expertise in the research topic (Longhurst, 2010). In this research, participants were selected via Google and LinkedIn; an e-mail was sent to ask them to participate in the research.

Requirements for participants:

- Participant is working at a municipality in the field of (sustainable) mobility
- or
- Participant is working with municipalities in the field of shared mobility/bike-sharing

In the table (1), an overview is shown of the respondents that were interviewed for this study.

Profession	Organization	Date	Interview number
Policy advisor mobility	Gemeente Midden-Drenthe	9 January 2024	#1
Policy advisor mobility	Gemeente Noordenveld	17 January 2024	#2
Policy advisor mobility	Gemeente Westerveld	14 February 2024	#3
Teamleader Sustainable mobility	Gemeente Aa en Hunze	28 February 2024	#4
Policy advisor sustainable mobility	Gemeente Westerkwartier	24 April 2024	#5
Policy advisor mobility	Province Drenthe	28 June 2024	#6
Contact person rural areas	Fietsersbond Groningen	11 September 2024	#7

Table 1: List of interviews

3.4 Data Analysis

All respondents who participated in this research permitted to record the interviews. The interviews are recorded using the Apple Dictaphone application. The audio recordings of the interviews were transcribed using the tools Goodtape and Microsoft Word (online). After that, the transcripts are coded using Atlas.ti. Atlas.ti is a tool valuable for qualitative data analysis. With Atlas.ti, codes can be attached to transcripts. According to Cope (2010), coding is a way of evaluating and organizing data to understand meanings in a text. It helps the researcher to find categories and patterns.

For this research, both inductive and deductive codes are used. First, the interview questions were made based on the theory described in Chapter 2. After that, the first set of deductive codes is created based on the literature and the interview guide. During the first phase of coding, several new, inductive codes were made based on the reactions of the respondents. Inductive codes were made based on gaps in the deductive codes, so all the interview data could be analyzed. Finally, a code tree has been made, where the codes are shown, and the relations between the codes and subcodes.

3.5 Ethical Considerations

Research ethics are important in qualitative research. According to Hay (2010), there are multiple reasons to do the research in an ethically responsible way. First, ethical behavior protects the rights of the respondents and communities affected by the research. Secondly, ethical behavior protects the ‘research climate’ to maintain public trust and trust within research communities. Third, research ethics are important to protect institutions as universities legally from unethical actions.

The research ethics set by Hay (2010) are met in this research. First, respondents gave permission to participate in interviews. Secondly, respondents were asked to give permission to the researcher that the interviews were recorded. Respondents gave oral permission. To protect the participants, they were asked if they wanted to receive the transcripts of the interviews.

After they gave their permission, the transcripts were used for analysis. Next to this, the name of the participant remains anonymous in this thesis. However, the participants agreed that the researcher is allowed to name their organization because it has significance in this research as it is about (local) policies. These policies can differ per municipality, therefore it is relevant to this thesis that the name of the organization is shown in this thesis.

To protect the privacy of the respondents, the audio files of the interviews are deleted after transcription. The transcripts will be deleted after the thesis is finished with a sufficient grade. The audio files and transcripts are stored on the researcher's computer. If respondents wanted to check the transcripts, they were given an option to read the transcripts. Next to that, the respondents were promised to receive a version of the thesis after grading if they wanted to.

Next to this, the researcher kept a neutral role. The researcher is not involved in any organization related to the subject. The researcher did not have an internship with a market party, and there are no ties with the interviewed municipalities.

Chapter 4: Results

In this chapter, the results of this study will be discussed. This chapter consists of three subchapters. In each subchapter, one of the sub-research questions will be discussed. Sub-question 1 is already discussed in the literature review in Chapter 2, therefore SQ2, SQ3, and SQ4 will be discussed in this chapter. The results in this chapter are based on the six conducted interviews and policy documents.

4.1 Bike-sharing and accessibility

In this subchapter the following sub-question will be discussed: *How can bike-sharing contribute to a solution for accessibility issues in rural areas?* First, the current accessibility issues in the research area will be addressed, as identified by the respondents. After that, the respondents' perceptions will be addressed: To what extent do they see bike-sharing as an option for the current accessibility problems?

4.1.1 Accessibility issues identified by respondents

This section explores the accessibility issues that are identified by the respondents of this research. In this research, the focus is on the supply-side of accessibility. The land-use side of accessibility is not discussed.

Currently, the car remains the dominant mode of transport in the studied municipalities. Despite ongoing efforts by local governments to promote cycling, the vast distances typical of rural areas make it impractical to rely solely on bicycles for daily transportation. Respondents (#1, #3, #5) consistently emphasized that the car is the primary means of transportation in their municipalities, and they do not foresee a significant shift towards other modes of transport, such as bike-sharing in the near future. The main reasons for this are the large distances inhabitants of rural municipalities have to cover between destinations, but also the unavailability of public transport connections between rural villages. (respondent #1, #3). This is supported by the claim of respondent #7 who identified that in rural areas there is a lack of last-mile options: there are carpool places present, but they are barely accessible by bike.

Moreover, the respondents pointed out the decline in public transport services within their municipalities as a growing concern. Respondent #2 mentioned that bus routes are being shortened, which further exacerbates the reliance on cars. While larger villages and towns remain relatively well-connected by public transport, smaller villages are increasingly isolated, with significantly fewer options available. Even in the larger villages, bus services often do not traverse the entire village; instead, they only stop at a hub located on the outskirts, making it inconvenient for residents without personal vehicles to cover the first mile to a public transport hub (respondent #2). This is illustrated in the following quote:

"We used to have a public transport connection through Peize, but it no longer runs through Peize. Now, it's located on the outskirts of Peize." – Respondent #2.

Another significant issue raised, according to respondent #7 from the Fietsersbond, is road safety in rural areas. Most roads between villages have speed limits of 60 to 80 km/h, and cyclists must share these narrow roads with motorists, as there are often no separate cycling lanes. This lack of infrastructure presents a safety risk for cyclists and further deters the use of bicycles as a viable mode of transportation in rural areas.

4.1.2 Role of bike-sharing

The opinions of the respondents on whether bike-sharing could be a solution to accessibility problems are divided. The main arguments in favor of bike-sharing are that bike-sharing is affordable, and if people are used to it they would use it more. The main argument against bike-sharing in rural areas is that most respondents are skeptical about the impact of it because the distances in rural areas are large.

Respondents #4 and #6 mentioned that bike-sharing can be an option to solve accessibility problems in the future, but they are still quite wary in their statements. However, most respondents believe that bike-sharing is not the ultimate solution to accessibility problems. Respondent #4 mentioned that bike-sharing can be an alternative for car use in the future, for people who cannot afford a car (anymore).

“Cars are becoming increasingly expensive, especially electric cars. So, it [bike-sharing] might offer a solution for people who eventually can no longer afford to own a vehicle themselves.” – Respondent #4.

However, respondent #4 mentioned that cars should be accessible for every inhabitant in the municipality Aa en Hunze, the respondent hopes that this will remain so in the future.

Respondent #6 believes that bike-sharing could be an option for rural areas in the future:

“I think it will take a long time, but if we all do it right, making use of shared bikes for the last mile, if that becomes a kind of self-evident travel option, then people will start using it. Over the last ten years, for example, you can see this with the OVfiets. It was always fairly popular, but it has also grown significantly.” – Respondent #6

Next to this, Respondent #6 explained that travelers heading to medium-sized cities are increasingly turning to the OV-fiets after taking the train for the first leg of their journey. The service has gained significant popularity due to the convenience it adds to travel. Though accessing the OV-fiets may be more challenging in rural areas, Respondent #6 noted that it can still be an effective solution in those regions as well, when more people are getting used to the usage of bike-sharing options. Another point Respondent #6 mentioned is described in the quote below:

“We see that people who are going to the city are more likely to use public transport and less likely to take the car, whereas in rural areas it’s the exact opposite. I think we all need to ensure that it becomes much easier to do things differently. And once that’s been the case for a while, people will start getting used to it, and then it might become even more of a natural choice.” – Respondent #6.

This quote shows that the respondent believes in the potential for bike-sharing to become an accepted travel option in rural areas, but he acknowledges that this shift will take much time and effort. The respondent uses the OVfiets, as an example of how a transportation option can gradually grow in popularity. Over the past decade, the OVfiets has transitioned from being a relatively popular choice to a well-known and frequently used service, particularly among people traveling to medium-sized cities by train. The respondent highlights that while rural areas may face more challenges in adopting such options, the convenience and positive travel experience provided by shared bikes could make them just as viable in these regions.

The quote also points out a contrast in transportation modes between urban and rural areas: inhabitants of cities are more and more using public transport and shared bikes instead of a car, while in rural areas, car use remains dominant. The respondent (#6) suggests that making alternative transport options easier and more accessible is key to encouraging broader adoption for bike-sharing.

4.1.3 Resumé

In section 4.1.1, respondents highlighted key accessibility issues in rural areas, where cars remain the dominant mode of transport. Despite efforts to promote cycling, the large distances between destinations and limited public transport options make it difficult to rely on bikes. Respondents expressed concern over the decline in public transport services, with bus routes being shortened, leaving smaller villages increasingly isolated. Even in larger villages, buses often only stop at hubs on the outskirts, making it inconvenient for residents without cars. Additionally, road safety for cyclists is a major issue, as many rural roads lack separate bike lanes, forcing cyclists to share narrow, high-speed roads with motorists.

In section 4.1.2 the opinion of the respondents is shown whether bike-sharing can solve accessibility problems in rural areas: they have mixed opinions about that. Supporters argue that bike-sharing is affordable and could gain popularity with regular use. However, many are skeptical due to the large distances in rural regions. Respondents #4 and #6 see potential in bike-sharing as a future solution, particularly for those who can no longer afford cars. Respondent #6 notes that, while bike-sharing is already successful in cities, it will take time and effort for it to be widely adopted in rural areas. The respondent uses the growing popularity of the OV-fiets as an example of how shared transport options can become viable over time. However, a significant contrast exists: urban areas increasingly rely on public transport and shared bikes, while cars remain dominant in rural settings. Making bike-sharing easier and more accessible could encourage broader adoption in rural areas.

4.2 Policies

In this section, the third research question will be discussed: *What current policy is present to encourage bike-sharing in rural areas and what tools do municipalities use to implement that?* This section exists out of five sub-sections. The first three sections describe the current policies regarding bike-sharing and other forms of shared mobility on the national level, the provincial level, and the municipal level. The fourth section describes the policy goals for future policies regarding bike-sharing. The fifth and final subsection describes the policy tools that the interviewed municipalities use. The concepts shown in the conceptual framework in section 2.5, are discussed here. The national policies are included in the strategic level. The provincial and municipal policies are included in the tactical level. The policy instruments and tools reflect to the operational level in the model.

4.2.1 National Policies

This section outlines the national policies and initiatives aimed at promoting bike-sharing, particularly in rural areas. During the interviews, none of the respondents mentioned specific national policies designed to improve the accessibility of bike-sharing in rural regions. However, respondent #6 highlighted that the national government is providing funding through the Regiodeal Zwolle, which supports the bike-sharing system in the municipality of Steenwijkerland.

While no direct rural-focused policies were identified, national efforts such as the Tour de Force initiative illustrate broader government involvement in promoting cycling. The Tour de Force involves collaboration between the national government, market players, knowledge institutes, and municipalities to improve national and regional cycling policies (Tour de Force, 2024). However, this initiative currently focuses on urban areas, as the research and pilot projects involve only urban municipalities.

In addition, the Mobility Alliance, a partnership including market stakeholders, the Fietsersbond, ANWB, and public transport providers, has provided policy recommendations through the Deltaplan 2035 report (Mobiliteitsalliantie, 2024). This report outlines strategies for incorporating shared mobility into the future transportation system. Key suggestions include developing a national plan for shared mobility, integrating shared mobility options at mobility hubs, creating a unified IT platform for shared mobility services, and harmonizing regional legal frameworks. However, these recommendations have not yet been implemented as national policy. Next to this, these recommendations are based on urban areas. Rural areas are not involved in national policy advice.

4.2.2 Provincial Policies

This section outlines the provincial policies on bike-sharing and related transport modes, based on input from respondents and policy documents, with a focus on policy goals and tools used by the provinces.

The provinces of Groningen and Drenthe play key roles in shaping bike-sharing policies. The provinces play a role in cycling infrastructure, and the hub program and are conducting pilots in shared mobility. Drenthe has made bike-sharing a priority through its mobility agenda (Provincie Drenthe, 2020). In an interview, a policy officer from Drenthe referred to as respondent #6, emphasized the province's primary goal of ensuring accessibility for all residents, including those without cars. Drenthe's efforts include initiatives such as the hub program and shared mobility services. While Groningen also addresses shared mobility in its mobility plan (Provincie Groningen, 2022), it does so in less detail compared to Drenthe.

Both provinces actively encourage cycling as an alternative to cars and public transport. This focus was consistently mentioned in interviews with respondents #1, #2, #3, #4, and #6. In Drenthe, the 'Fietsplan' initiative promotes cycling, with municipalities responsible for implementing the plan. Respondent #4 explained that cycling lanes must meet certain standards, such as width requirements, to be included in the 'Fietsplan.' Similarly, in Groningen, there are 'doorfietsroutes,' cycling lanes that adhere to specific standards, developed in collaboration with the province (as mentioned by respondent #5).

One key initiative is the hub program, a collaborative project between Groningen, Drenthe, and the municipality of Groningen. According to respondent #2, this program focuses on creating public transport hubs, with ownership depending on landownership at the hub locations. Some hubs are owned by the province, while others are managed by municipalities. Respondent #3 highlighted that in certain cases, provincial ownership results in limited municipal involvement.

In the area of shared mobility, Drenthe led a pilot car-sharing project in its northern region, but it faced significant challenges. Respondent #4 mentioned that the cars were often misused during nighttime, leading to vandalism and a decrease in usage. Respondent #6 echoed these concerns, attributing the pilot's failure to the poor location of the shared cars. Despite the

setbacks, respondent #4 acknowledged that pilots are intended to test new ideas, and lessons from this project could be applied to future bike-sharing initiatives.

Beyond these specific initiatives, Drenthe has established a mobility council, as noted by respondents #1 and #4. This council, comprising policy officers from all municipalities in the province, meets to discuss ongoing mobility issues such as traffic safety and bus route maintenance. One of the council's main objectives is to ensure that all municipalities in Drenthe develop clear, coordinated mobility policies.

A policy goal for the province of Drenthe, according to respondent #6, is to expand the use of shared bicycles, particularly for last-mile transportation, although they are also open to other uses. Over the coming years, the province plans to collaborate with various partners to conduct pilot projects, exploring where bike-sharing can be successful and where it may face challenges.

“But it is indeed stated in our implementation program that we want to deploy shared bicycles as well. Especially for the last mile, but it could also be for other trips. What we plan to do in the coming years is to explore this together with other parties, including through practical pilots, to determine in which cases shared bicycles are successful and where they are not.” – Respondent #6

Key tools for advancing bike-sharing policies include information sharing and networking. As respondent #1 mentioned, Drenthe's mobility council serves as a forum where policymakers from across the province meet to discuss recent trends. Respondent #4 also highlighted an annual meeting for policymakers from the entire Northern Netherlands region, where similar mobility issues are discussed.

Subsidies play a crucial role in supporting bike-sharing initiatives. Respondent #6 emphasized the importance of learning from other municipalities and pooling resources through subsidies to enhance pilot projects. These funds may come from the national government or regional collaborations, such as the Regiodeal Zwolle. For instance, the bike-sharing system in Steenwijkerland, which includes Westerveld, is supported by funding from this deal. Respondent #6 also mentioned that European subsidies are being sought for larger projects, such as a new train connection between Coevorden and Emlichheim across the German border.

However, respondent #3 pointed out a "cultural difference" between the northern provinces and the Zwolle region, noting that Zwolle appears more focused on the provinces of Overijssel and Gelderland, despite Westerveld's proximity to Overijssel.

Overall, while some municipalities are more advanced in their bike-sharing policies, the importance of information sharing allows others to learn from these experiences and avoid ineffective approaches.

4.2.3 Municipal policies

In this section, the municipal policies will be shown according to the respondents and policy documents. Next to that, there will be an elaboration on the policy goals and tools that are used by municipalities.

In addition to the provincial policies previously discussed, respondents also highlighted municipal policies related to shared mobility. Most municipal policies focus on car-sharing, with some future plans for bike-sharing. However, there is a notable lack of clear policies specifically addressing bike-sharing in the municipalities that were interviewed.

Among the municipalities in Drenthe, three out of four (#1, #2, and #4) have emphasized a focus on cycling in their mobility policies. Despite this emphasis, these municipalities do not yet have well-defined policies for bike-sharing. Respondent #4 mentioned that the new mobility plan for Aa en Hunze will include shared mobility, but the specific goals and strategies have not yet been clearly outlined. This is reflected in the following statement:

“Yes, we are working on a new [municipal mobility plan]. We now have a draft ready. The idea is that it will be finalized and approved this year. It will include an implementation program focused on traffic safety as well as sustainability. Sustainability concepts such as shared mobility will also be included.” - Respondent #4

In the municipality of Westerveld, where bike-sharing is already available, policy officer #3 noted that there are no specific policies designed to promote bike-sharing. The existing bike-sharing stations in Westerveld are part of a larger network that extends into neighboring municipalities. The policy officer mentions that bike-sharing is suitable as a complementary addition to the current transportation options, rather than a primary focus in their mobility strategy. Respondent #3 mentioned that there is no primary focus on bike-sharing in the municipality, however, although it is present.

Furthermore, the respondent from Westerkwartier provided an example of the general attitude of the interviewed municipalities towards bike-sharing. While there is recognition of its potential benefits, there is currently a lack of specific policies dedicated to promoting bike-sharing. This sentiment is captured in the following quote:

“In that sense, bike-sharing policies could indeed contribute positively to sustainability policies or sustainable mobility. However, we currently do not have a specific policy in place for this. Nevertheless, we are always looking into what is possible.” - Respondent #5

This collective feedback highlights a common theme: while municipalities acknowledge the value of bike-sharing as part of a broader sustainable mobility strategy, many have yet to develop concrete policies to support and promote its integration into their transportation systems. The recognition of the potential benefits of bike-sharing suggests a growing awareness and openness to incorporating shared mobility solutions in the future, but the current lack of specific policies indicates that more work is needed to translate this awareness into actionable plans.

During the interviews, different views in municipalities were seen towards bike-sharing. Some municipalities do have goals to add more shared bicycles in their municipalities. These goals differ from expanding the number of shared bicycles in the municipality, which is very broad (#5), and getting more OVfietsen in collaboration with NS, to adding a full-scale independent bike-sharing network in the municipality. However, some respondents mentioned that they are not interested in adding shared bicycles to their current transport options (#1). Respondent #4 mentioned in the quote below that his municipality (Aa en Hunze) has the ambition to introduce a bike-sharing system to the municipality. However, they are waiting for the province to take the initiative.

For a bike-sharing system, a third party is required since the municipality Aa en Hunze according to respondent #4 does not wish to manage the shared vehicles themselves. This third party is sought from the market and could provide the necessary services. One such potential partner is the NS, with their OVfiets. However, respondent #5 mentioned that communication

with the NS has been problematic. Westerkwartier aims to expand the number of OV-fietsen at more stations within the municipality, but they are uncertain about whom to contact or who is responsible. This concern is echoed by policy workers in Midden-Drenthe (#1), who also lack clarity on who manages the OV-fiets in their municipality. Respondent #4 and Respondent #5 further noted that their municipalities' car-sharing pilots were conducted in collaboration with a market operator that manages the shared vehicles. In these instances, the municipality delegates the operation of the network to the market party within a specified budget.

The municipality of Westerkwartier mentioned an example of how the municipality is communicating by researching the needs of local residents. With this means, the municipality can find out if there is a demand for new forms of transport, for example, bike-sharing.

"For example, we do have a budget for facilitating and initiating things. We use funds to conduct research, such as surveys to assess the need for certain services. For instance, we might conduct a survey on shared mobility. We use all these resources to stimulate or facilitate initiatives. Ultimately, if the need arises, we can also try to see through the [municipal] council if there are additional resources we can allocate." – Respondent #5.

The municipality is, therefore, first looking if there is a need for a certain new project. If there is, the policy workers have to go to the municipal council and ask for permission to execute the policies.

4.2.4 Resumé

The current policies to promote bike-sharing in rural areas are developing across national, provincial, and municipal levels, with varying degrees of progress and focus.

At the national level, there are no specific policies targeting rural bike-sharing. Initiatives like the Tour de Force and Deltaplan 2035 promote cycling and shared mobility, but they focus mainly on urban areas. However, national funding through programs like the Regiodeal Zwolle supports bike-sharing in some rural municipalities, such as Steenwijkerland.

Provinces like Drenthe and Groningen play a key role in shaping rural bike-sharing policies. Drenthe prioritizes bike-sharing in its mobility agenda, focusing on accessibility and last-mile transport. The province leads shared mobility pilots and coordinates efforts through its mobility council. Despite challenges with car-sharing pilots, Drenthe plans to expand bike-sharing through practical pilots. Groningen supports cycling with initiatives like doorfietsroutes but focuses less on bike-sharing.

Municipalities are mostly in the exploratory phase, with an emphasis on car-sharing over bike-sharing. Westerveld has some bike-sharing stations, but lacks a dedicated policy, while Aa en Hunze and Westerkwartier are considering bike-sharing but face challenges with partnerships and clarity on management. Municipalities often rely on private operators for shared mobility projects and assess local demand through surveys.

The most important policy goals identified are expanding shared bicycles for last-mile transport and promoting cycling as a sustainable alternative. Next to this, the most used policy tools are information sharing, networking (e.g., Drenthe's Mobility Council), subsidies, and public-private partnerships to manage shared mobility networks.

While rural bike-sharing policies are emerging, they remain largely undeveloped, with provincial support and collaborative efforts driving future growth. Next to this, it is remarkable

that most policies focus mostly on the demand side of bike-sharing. This is because the current policies are mostly focused on understanding potential demand and feasibility. Maybe after that is clear for municipalities, the focus will shift to the supply side. The only identified policy tool that is focused on the supply side is subsidies.

4.3 Success Factors and Barriers for bike-sharing in rural areas

In this section, sub-question 3 will be answered: *What are the success factors and barriers for bike-sharing in rural areas?* This sub-question will be answered with results from the in-depth interviews. First, the success factors will be described, and after that the barriers.

4.3.1 Success Factors

Several success factors were identified during the interviews, which will be discussed in this section, focusing on the two existing bike-sharing networks in the northern Netherlands. For the OVfiets network, its success is attributed to its ease of use, widespread recognition, and extensive availability at nearly every train station across the country. The success of the Deelfiets Nederland network, operating in Steenwijkerland and neighboring municipalities, lies in its adaptability and its ability to attract a broader range of users than originally intended.

The most prominent BSS in the research area is the OVfiets network. The OVfiets is available at all major urban train stations and increasingly at rural train stations as well. Its presence is expanding, with more rural stations adopting the service to meet growing demand. Next to this, the respondents argued that the OVfiets is easy to use.

"And then the OVfiets is used more and more frequently. It is a very well-known product. People also see how much more pleasant it is to travel with it. In rural areas, it might be a bit less easy and straightforward, but it can work just as well." – Respondent #6.

This respondent highlighted that the OVfiets has become increasingly popular, demonstrating its effectiveness and appeal in both urban and rural settings. The growing success of the OVfiets has spurred municipalities to explore opportunities to expand the network further into their areas. However, their ability to influence such decisions is limited.

"Because the NS [Dutch Railways] also says that such a bike-sharing system is a business model for them. People can simply check in with an OV-chipkaart and then use a bike. So, I find it odd that they don't have this at every station. But, as you mentioned, we do not have much influence over that. However, we can certainly lobby. Ultimately, though, it is up to NS." – Respondent #5.

This respondent noted that while the OVfiets is a successful business model for NS, the decision to implement it at every station remains with the organization. Although municipalities can advocate for more widespread availability, the final decision rests with NS. The challenge is not just about expanding the network but also about navigating the operational and business considerations of NS.

Another example of a successful bike-sharing network is the network operated by Deelfiets Nederland in Steenwijkerland. Deelfiets Nederland operates in Friesland and Overijssel, with bike-sharing hubs strategically located at various transport points. While most of these hubs are situated at train stations, some are also found at major bus stops and transport hubs. The bike-sharing system in Steenwijkerland is part of the Deelfiets Nederland network. The bike-sharing system in Steenwijkerland has proven to be a success. The system was initially designed to enhance accessibility for tourists, the system has also gained popularity among local residents

and soldiers stationed at the nearby military base in Havelte. Recognizing the demand, a dedicated hub with shared bicycles was even established near the military base, demonstrating the system's adaptability and appeal to a broader user base than originally anticipated. This success highlights the potential of bike-sharing programs to serve diverse communities, addressing both tourists and local mobility challenges. The adoption of the system by various user groups suggests that such initiatives, when well-implemented, can contribute significantly to the overall transportation network, improving connectivity and convenience for all. As Steenwijkerland's experience shows, bike-sharing can extend beyond its initial target audience, offering practical benefits to a wider population. With this success in mind, the province of Drenthe wants to expand the bike-sharing system. The policy worker illustrated that in the following quote:

"There are also two municipalities in Drenthe where the bikes have been and will be placed. Based on the success we have seen there, we would like to expand this to Southwest Drenthe as an addition to the current mobility options." – Respondent #6.

This planned expansion reflects the growing recognition of bike-sharing as a component of regional transportation policies, aiming at expanding mobility and accessibility across rural areas.

4.3.2 Barriers

During the interviews, the respondents mentioned that there are a lot of barriers to implementing a successful bike-sharing network in their municipality. In total, five main barriers for implementing a successful bike-sharing network in rural areas were identified by the respondents: the reliability of the network, usage, safety, financing, and unfamiliarity with the subject.

The first identified barrier for implementing a bike-sharing network in a rural area is according to the respondents (#4, #6) the reliability of both the public transport network and the future capacity of shared bicycles, with the rurality of the area. Respondent #1 stated that there are concerns about whether there are enough shared bicycles ready when one is needed by a user. Due to the relatively low population density of the area, the respondent is concerned that it is not viable to place enough bikes. Next to this, the respondent did not see the necessity for implementing a bike-sharing network in the area. The respondent said that there are limited bus stops in the municipality of Midden-Drenthe, and if there is a bus stop in a village, the village is small enough that the distances are walkable.

"There aren't many buses that pass through the area. And if you do take the bus and arrive in a small village, it's only a five to ten-minute walk and you're home." – Respondent #1.

However, the respondent did not address the necessity for people whose destination is outside a village. Respondent #5 mentioned that the distances between villages in his municipality (Westerkwartier) are too large to cover by bike. However, respondent #5 said that e-bikes could be considered because they can cover large distances. Despite this, the main transportation mode would still be a car in the municipality, according to him. Overall there can be said that respondent #1 and respondent #5 have low expectations that a bike-sharing network will fit in rural areas.

The second barrier identified by the respondents is the belief that most residents in their municipalities already own a bicycle and that visitors to the area typically bring their own bikes

on the back of their cars while on holiday. This assumption leads to a perception that there is little demand for alternative options like bike-sharing programs. As a result, local authorities may see less value in investing time and resources into promoting or implementing such initiatives. However, this perspective overlooks potential users, such as tourists who prefer not to transport their bikes, tourists who are using public transport to reach their destinations or residents who might benefit from having access to a shared bike for specific occasions. By not considering these possibilities, municipalities may miss out on opportunities to enhance mobility and attract more visitors to their areas. The following quotes illustrate this:

"For commuters and students, they naturally come to the bus stop on their own. And they come on their own bikes. So, you don't need a shared bike for that." – Respondent #2.

"People who come here to visit [tourists] usually have their own bikes. They often come here, even in the summer, to go cycling. With bikes on the back of their camper, or in the caravan. So, in that sense, I don't think there's much of a problem without shared bikes, let me put it that way. There's not a lot of demand for them." – Respondent #3.

Respondent #2 identified safety as a barrier. The respondent expressed their concerns about the potential risks associated with shared bicycles. Respondent #2 is worried that these bicycles might be vandalized or abandoned in inappropriate locations, creating clutter and safety hazards in public spaces. The fear is that without proper oversight, shared bikes could become a nuisance, obstructing pathways or being left in areas where they could pose a danger to pedestrians or disrupt the community's aesthetic. However, other respondents did not share this concern.

Another barrier to the implementation of bike-sharing programs is the challenge of establishing a viable business case, particularly in rural areas. Respondent #6 highlights this struggle, stating:

"The business case. There isn't a single provider that will do it on their own without something in return. At least not at this moment. And you see with shared mobility in cities that it's very attractive for larger cities, but much less so for smaller ones. And that just comes down to money." – Respondent #6.

This quote underscores the financial difficulties faced by bike-sharing initiatives outside urban centers. In larger cities, where demand is high and consistent, shared mobility services can thrive, attracting private providers who see the potential for profit. However, in smaller towns and rural areas, the lower population density and less frequent usage make it difficult to generate sufficient revenue to sustain bike-sharing systems without external support. This economic reality often deters private companies from investing in bike-sharing schemes in these areas, as the return on investment is uncertain. A possible solution respondent #6 mentioned was the collaboration with entrepreneurs. If local tourist destinations and holiday parks promote bike-sharing among their customers, a larger user group can benefit from the bike-sharing network. Next to this, respondent #6 mentioned that the province is considering seeking collaborations with local businesses that could encourage their employees to travel to their jobs in a multimodal way: using public transport and potentially shared bicycle for the last mile.

Next to this, this challenge is compounded by the fact that rural communities typically have fewer resources to subsidize or support these initiatives. Unlike urban areas, which might have

access to more extensive public funding or private partnerships, smaller municipalities often struggle to find the financial backing needed to make bike-sharing viable.

The final barrier identified during the interviews is the lack of familiarity with new modes of transport among municipalities. A policy officer from the province of Drenthe highlighted this issue:

“There are municipalities that say, ‘It’s not a concern in our area; we haven’t heard anything from the neighborhoods or villages. We’re already busy, so why should we address this now?’ This reflects a broader issue of unfamiliarity—what’s unknown is often overlooked. We’re trying to encourage them to explore the possibilities and learn from what’s happening elsewhere. It could be very beneficial for their village, but if they aren’t aware that such options exist, they won’t consider them.” – Respondent #6.

This issue was also mentioned in other interviews, particularly by policy officers from smaller municipalities. They explained that they are often stretched thin, managing a wide range of responsibilities within mobility and accessibility—from roads and parking to cycling. In these contexts, initiatives like bike-sharing are just one small part of their workload, leaving them with limited time to focus on them.

4.3.3 Resumé

In this study, two success factors for bike-sharing networks in rural areas are identified. The success factors of the OVfiets network are the strategic placement at train stations and its user-friendliness due to the OVchipkaart system. More and more people are using the OVfiets and municipalities are seeking ways to expand the network.

The other successful bike-sharing network is the one in Steenwijkerland. The success factors of this network are the adaptability and in its ability to attract more users than the initial target group. While the network was first established for tourists, also other groups are using the network, such as residents and for example soldiers stationed at a local military base. Due to these successes, the province wants to expand the network in South Drenthe.

The implementation of bike-sharing networks in rural areas faces several challenges, as identified by respondents in the study. One major barrier is the reliability of the network, with concerns about the limited public transport infrastructure and low population density in rural areas. Respondents expressed doubts about whether there would be enough shared bicycles available when needed, given the smaller number of users compared to urban settings. Additionally, many rural residents already own bicycles, and visitors often bring their own, reducing the perceived demand for shared options. This view, however, overlooks potential users such as tourists who rely on public transport or residents needing occasional bike use, creating a gap in understanding the full potential of a bike-sharing network.

Another key issue is financing, as rural bike-sharing programs struggle to develop a sustainable business model due to lower demand and population density. Unlike urban areas, where shared mobility services can attract private providers, rural municipalities lack the resources to subsidize or support such initiatives. Safety concerns, though not universally shared, also contribute to hesitation, with fears of vandalism and abandoned bikes cluttering public spaces. Additionally, unfamiliarity with bike-sharing concepts further limits progress, as smaller municipalities often prioritize other pressing issues, leaving little room for exploring innovative

transport solutions. Addressing these barriers will require collaboration, financial creativity, and increased awareness of the potential benefits bike-sharing could bring to rural mobility.

4.4 Conditions for the implementation of bike-sharing in rural areas

In this section, the fifth sub-question will be discussed: *What conditions should be met for the implementation of bike-sharing in rural areas?* The conditions mentioned in this section are retrieved from the interviews. In the interviews, the respondents mentioned several conditions that they think are necessary for implementing a successful bike-sharing network in their municipality and other rural municipalities. The first condition is the availability of a budget to subsidize a bike-sharing network. The second condition is the ambition of local policymakers. The third condition is the capacity of the bike-sharing network and the fourth condition is how the network is presented to potential customers and the fourth condition is the presence of safe cycling infrastructure.

The first condition Respondent #4 and Respondent #6 mentioned was *the availability of budget (1)*. A bike-sharing system costs money and is according to the respondents not profitable in rural areas for an external operator, which is a market party and therefore should make money. Therefore a bike-sharing system is dependent on subsidies from the government or collaborations should be arranged with local entrepreneurs in tourism or business. The opinion of respondent #4 is shown in the quote below.

“Perhaps that’s why we also have several thoughts about the province being the driving force, the one leading the way, while we follow. Maybe this has something to do with being a rural municipality compared to an urban municipality, for example. But ambition and a bit of courage are part of it as well. Just do it instead of sitting here pondering. It’s also a matter of cost, especially to set up and maintain a good network. Additionally, it’s a bit of a chicken-and-egg situation. Do we wait for the demand for bike-sharing, or do we set up the system and hope that this leads to increased use?” - Respondent #4

The quote also shows the second condition for a bike-sharing network in rural areas, according to respondent (#4): *the ambition of local policymakers (2)*. The respondent stressed that local authorities must be willing to take bold steps in introducing new forms of mobility. Waiting for demand to grow before acting could lead to missed opportunities; instead, proactive action might stimulate interest and use. This requires not only funding but also a shift in mindset, where municipalities embrace innovative transportation solutions rather than hesitating due to perceived risks or uncertainties.

The third condition that was mentioned during the interviews is the availability of a *wider network in the area (3)*.

“Bike-sharing hubs, as seen in Steenwijkerland, work best when there is also a network in place. You need a starting and ending point, right? So, the bus stop and the destination could be a business, for example.” - Respondent #6.

Respondent #6 emphasized the importance of location when implementing shared mobility solutions, a principle that applies to both car-sharing and bike-sharing initiatives. He noted that the success of these programs depends significantly on where the shared vehicles are placed. In the case of a car-sharing pilot, he highlighted that choosing the right location is crucial for

ensuring accessibility and convenience for potential users. Effective communication also plays a key role; users need to be well-informed about the availability of shared vehicles and their locations.

This insight is also relevant for bike-sharing. As with car-sharing, the placement of shared bicycles must be strategic, taking into account the needs and habits of potential users. Without proper communication and careful consideration of locations, even the best-intentioned mobility initiatives could fail to attract sufficient usage. Next to this, Respondent #6 stated that a station-based bike-sharing system is more suitable for rural areas than a free-floating network. According to the respondent, the distances in rural regions make it impractical to implement a free-floating system. The logistics of managing and maintaining bikes in a large low-density area would pose challenges, such as ensuring the availability of well-maintained bikes and defining clear areas for pick-up and drop-off.

Additionally, the respondent highlighted the importance of using electric bikes over non-electric ones. In rural areas, where distances between destinations can be considerable, electric bikes offer a more practical and efficient mode of transportation. Since electric bikes need regular charging, a station-based system would also facilitate this process, ensuring that bikes can be charged at designated locations. This setup would streamline both the management and maintenance of the bikes, making the system more reliable and efficient for users.

Another condition for the success of bike-sharing networks in rural areas is the availability of users. The Steenwijkerland network demonstrated that tourism can generate a substantial pool of potential users. When these users are present, local residents can also benefit from the network, improving accessibility for the community as a whole. In rural regions with high visitor traffic, bike-sharing networks are likely to experience higher usage compared to areas with fewer visitors, making the system more sustainable and valuable for both tourists and locals alike.

The fourth condition was highlighted by the respondent from the Fietzersbond (#7), who emphasized that *safety is crucial for the successful implementation of bike-sharing in rural areas* (4). As noted in section 4.1, many rural roads are currently designed primarily for cars, making them unsafe for cyclists. This lack of infrastructure discourages potential bike-sharing users, as they may feel vulnerable navigating roads dominated by motor vehicles. To address this, the respondent proposed redesigning these roads to better accommodate both cyclists and motorists, ensuring safer and more accessible routes.

According to respondent #7, the idea involves creating wide, clearly marked lanes for cyclists on either side of the road, with a narrower lane for cars in the center. This layout would force motorists to slow down and share the space more carefully, thereby encouraging safer driving habits. Additionally, such changes would signal a shift in priority toward sustainable, multimodal transport, making cycling a more appealing option for residents and visitors alike. By enhancing road safety, this design could significantly increase bike-sharing usage and help integrate cycling more effectively into rural transportation networks.

Chapter 5: Conclusion and Discussion

In this chapter, the conclusions and discussion of this research will be discussed. In section 5.1, the answers to the sub-questions will be discussed, followed by an answer to the main research question. Section 5.2 presents a discussion of the research findings in the context of existing literature. Section 5.3 evaluates the strengths and weaknesses of this study. In section 5.4, recommendations for future research and practical planning are shown. Finally, section 5.5 will provide a reflective overview of the research process

5.1 Conclusions

5.1.1 Sub-Questions

1. *What is bike-sharing and what forms of bike-sharing are there?*

On the basis of the literature review in Chapter 2, shared mobility can be defined as the use of bikes, cars, motors, or other vehicles on an as-needed basis (Shaheen and Chan, 2020). In this context, bike-sharing refers to the communal use of bikes or e-bikes as needed. Shaheen (2016) identifies several types of bike-sharing systems, with the two most prominent being station-based and free-floating. In a station-based bike-sharing system, bicycles are linked to specific stations. Users can rent a bike at a station and are required to return it either to the same station (known as "back to one") or to another designated station (known as "back to many"). In contrast, dockless bike-sharing systems do not require dedicated stations for bike rental or parking. Users can pick up a bike from any location within a predefined area and park it wherever they choose within that area. This model offers greater flexibility in bike usage and parking.

2. *How can bike-sharing contribute to a solution for accessibility issues in rural areas?*

In Chapter 4.1, accessibility issues in rural areas are identified. They include declining public transport services, heavy reliance on cars, rising car ownership costs, and road safety concerns. Bike-sharing presents a cost-effective alternative to car ownership, potentially improving access for those with limited budgets and addressing affordability issues. Additionally, it could help bridge the last-mile gap, offering a solution for traveling between public transport hubs and final destinations. Next to the this, the Steenwijkerland network shows that aiming for tourists, can create a larger pool of potential users.

However, respondents expressed skepticism about bike-sharing as a comprehensive solution due to the large distances typical of rural areas. Despite this, they acknowledged bike-sharing's potential to enhance rural mobility over time, especially if integrated with other transport solutions and adapted to local needs. As bike-sharing systems evolve, they may play a valuable role in addressing rural accessibility challenges. In conclusion, while bike-sharing may not fully resolve all accessibility issues in rural areas, its potential benefits as an affordable and flexible transportation option suggest it could significantly improve mobility over time when integrated with broader transportation strategies

3. *What current policy is present to encourage bike-sharing in rural areas and what tools do municipalities use to implement that?*

Section 4.2 examines the national, provincial, and municipal policies related to bike-sharing. At the national level, there is a lack of specific bike-sharing policies, with only general policy advice

provided to the government. In contrast, provincial policies in Groningen and Drenthe offer more detailed strategies for promoting cycling, including the development of additional cycling routes. Notably, Drenthe is expanding its bike-sharing options following the success of the Steenwijkerland network.

At the municipal level, especially in rural areas, bike-sharing policies are still in the exploratory phase. While bike-sharing exists in some municipalities, concrete policies and goals for integration are lacking. Rural municipalities are using various governance tools to explore bike-sharing, such as pilot projects and information sharing through provincial mobility councils. Despite these efforts, the success of a recent car-sharing pilot was limited, and rural municipalities face challenges in making bike-sharing viable without additional subsidies.

4. *What are the success factors and barriers for bike-sharing in rural areas?*

The success of bike-sharing programs in rural areas can be illustrated by two examples: the OVfiets network and the bike-sharing system in Steenwijkerland and its surrounding municipalities. The OVfiets network, which operates at nearly all Dutch train stations—including those in rural areas—owes its success to its user-friendliness and strategic placement at key public transport hubs. On the other hand, the Steenwijkerland bike-sharing network has thrived by serving a broader user base than initially intended. While it was originally designed for tourists, the network is now frequently used by local residents and workers, demonstrating its adaptability and appeal to diverse groups.

The barriers identified by the respondents for bike-sharing in rural areas are capacity, usage, safety, financing, and unfamiliarity with the subject. Limited public transport infrastructure and low population density raise concerns about the adequacy of bike availability, as rural areas have fewer users compared to urban settings. Additionally, many rural residents already own bikes, and visitors often bring their own, potentially reducing demand for shared options. Financial sustainability is another issue, as lower demand and population density make it difficult to attract private providers or secure subsidies. Safety concerns and unfamiliarity with bike-sharing concepts are another barrier. Overcoming these challenges will require collaboration between municipalities and different government levels collaboration between municipalities and market parties, for example entrepreneurs in the tourism sector, innovative financing, and increased awareness of the benefits bike-sharing can offer to rural mobility.

5. *What conditions should be met for the implementation of bike-sharing in rural areas?*

In section 4.4, conditions for the implementation of bike-sharing in rural areas are identified. These conditions must be present, according to the respondents for implementing a successful bike-sharing network in rural areas. These conditions are the availability of a budget to subsidize a bike-sharing network, the ambition of local policymakers, the capacity of a bike-sharing network, and the presence of safe cycling infrastructure, such as separate cycling lanes. Next to this, another important condition is the collaboration of municipalities with the tourism sector. Targeting tourists and other visitors for a bike-sharing network can create a larger group of potential users and therefore the reliability of the network. By addressing these conditions, rural municipalities can improve the feasibility and effectiveness of bike-sharing initiatives, enhancing mobility options for their residents and visitors.

5.1.2 Main research question

- *How do municipalities govern bike-sharing in rural areas?*

This study provides multiple perspectives on how bike-sharing is governed in rural areas. Municipalities currently lack specific policies for bike-sharing in rural areas, but they are increasingly recognizing the potential of such systems and are starting to explore options. They rely on a variety of governance tools, including pilot projects, information sharing, and collaboration with provincial governments. The provinces of Groningen and Drenthe have taken the lead in promoting cycling, with Drenthe expanding its bike-sharing options. Rural municipalities are mainly in an exploratory phase, focusing on gathering information and beginning to formulate policies.

Municipalities also face several challenges, such as limited public transport, low population density, and existing bike ownership, which complicate the introduction of bike-sharing. However, success factors identified include the strategic placement of bike-sharing hubs and serving a broad user base, as seen in the OVfiets and Steenwijkerland networks. The Steenwijkerland network, also gives an example of how

For effective governance, collaboration between the actors involved in bike-sharing is the key. Rural municipalities need to partner with neighboring municipalities, provinces, and private stakeholders, as no single municipality has the resources to establish a sustainable bike-sharing network on its own. Next to this, a bike-sharing systems that is crossing municipal borders, gives users more options to reach more destinations. Additionally, financial support through subsidies and safe cycling infrastructure are critical conditions for success. Municipalities must be proactive and ambitious, integrating bike-sharing with broader mobility strategies to enhance rural accessibility and meet the new transporting needs of its residents and visitors.

5.2 Discussion

This research explored bike-sharing from a governmental perspective, focusing on how public municipalities approach the governance and development of bike-sharing systems. The topic itself has limited theoretical foundations, However, when compared to the theoretical framework discussed in Chapter 2, the findings reveal some notable parallels.

One similarity to the literature are the success factors. Some success factors of bike-sharing discussed in section 4.4, particularly the OV-fiets are similar as the success factors Ploeger (2024) discussed. According to Ploeger (2024), the main success factors are its design and its payment system. This is in line with the opinion of the respondents.

Another similarity is found in the governance levels identified by Van der Velde (1999), which were echoed in the interview responses. The results indicate that in rural areas, the governance of bike-sharing systems remains largely at the strategic and tactical levels. This suggests that bike-sharing in these regions is still in an exploratory or developmental phase, with policymakers and stakeholders primarily focused on long-term planning and mid-level decision-making. Another remarkable finding, is that there is no policy yet on the national level. The current policies is still fragmented, as many municipalities are exploring the topic of bike-sharing on its own. However, there are means, such as the mobility council in Drenthe, that could help municipalities to learn from each other on the topic of bike-sharing.

However, there are promising signs of progress at the operational level, as evidenced by emerging developments in the field. The successful implementation of bike-sharing infrastructure in studied areas shows that, despite being in the early stages of strategic and tactical planning, practical advancements are already being made. This indicates that bike-sharing initiatives, although not yet fully matured, are gaining traction and contributing to the broader mobility landscape.

In the results section, several success factors, barriers, and conditions for implementing bike-sharing systems in rural areas are explored. One of the key barriers highlighted by respondents is the need for reliability of the bike-sharing network. To ensure this, there must be a sufficient number of potential users to justify the availability of shared bicycles. A crucial condition identified to address this is the inclusion of tourism in the network. Tourists, in addition to local residents, can significantly increase demand. To achieve this, it is important to consider the land use in rural areas. Collaborating with local campgrounds, visitor attractions, and other tourist hotspots can enhance the viability of the system. They can also provide additional budget. As a result of that, a rural bike-sharing network could be less dependent on subsidies.

5.3 Strengths and limitations

The main strength of this study is that it is focused on a niche topic: the governance of bike-sharing in rural areas. There is not yet much research done in how bike-sharing networks in rural areas are operated and governed. For this thesis, the focus was on the perception of local policy makers. The interviews offer insights in the way they think and what considerations they make regarding bike-sharing.

However, the study also has some limitations. Its geographic scope is relatively narrow, focusing on a small number of municipalities in the Netherlands, and the sample size of respondents is limited. Expanding the research to cover a wider range of rural municipalities across the country would provide a more comprehensive understanding of bike-sharing governance in the Netherlands. Moreover, the study could benefit from a broader range of stakeholder perspectives, including interviews with providers like Deelfiets Nederland and NS, as well as other market participants. Including these additional viewpoints would deepen the analysis and offer a more holistic view of the opportunities and challenges facing bike-sharing in rural regions.

5.4 Recommendations

For future research, expanding the scope to cover a larger geographical area and conducting more interviews would be highly beneficial. This study primarily focused on governance in the northern part of the Netherlands and relied on the perspectives of policy workers. Including the views and opinions of local residents would offer a deeper understanding of the potential for bike-sharing programs in rural areas. Such research could help determine whether these initiatives align with community needs and expectations, providing a more comprehensive picture of their viability.

In addition, this thesis primarily focused on the supply side of bike-sharing systems. Future research could explore the demand side to provide a more comprehensive understanding. It may also be valuable to take a broader perspective on the land-use implications of bike-sharing. Some findings suggest potential opportunities for implementing bike-sharing networks tailored

to different user groups, such as tourists. Further studies could offer deeper insights into these possibilities.

Additionally, while this research centered on governance, sustainability emerged as a critical theme during interviews. Respondents emphasized that municipalities are increasingly prioritizing sustainability, but they face significant challenges in implementing sustainable transport options. Future studies focusing on strategies to improve the sustainability of rural transport systems could offer valuable insights, addressing these challenges and helping municipalities develop more effective solutions.

A key recommendation for rural municipalities is to actively seek collaboration if they aim to establish successful bike-sharing networks in their area. While municipalities often look to each other or the province for leadership, proactive collaboration is essential. This cooperation should extend beyond provincial borders, as municipalities may be part of the broader service area of a city like Groningen. Additionally, collaboration with local entrepreneurs can be pursued. While bike-sharing holds potential in rural areas, it requires a sufficient number of users to be viable. This potential can be enhanced by including visitors, such as tourists, in the target user group.

5.5 Reflection on the research process

In the literature review, mainly the articles of Shaheen and co-authors are used to describe the definition of bike-sharing and its adaptations (Shaheen and Chan, 2016, Shaheen et al., 2020, Shaheen et al., 2010, Shaheen et al., 2011). Next to that, the framework provided by Van der Velde (1999) is used as an analyzing tool for bike-sharing in a governmental context. While the levels of Van der Velde (1999) and the definitions of Shaheen et al. (2010) were familiar to respondents, a broader foundation of literature could be used to describe bike-sharing.

A total of seven interviews were conducted with municipal employees, provincial representatives, and the Fietsersbond. Unfortunately, no interviews were secured with bike-sharing providers, as NS did not respond, and Deelfiets Nederland declined participation. Including interviews with providers would have offered deeper insights into the supply side of bike-sharing and provided valuable policy recommendations aligned with provider needs and expectations. Next to this, more interviews with municipalities could have been conducted. Especially an interview with the municipality of Steenwijkerland would be interesting for this study, however I did not succeed in making an appointment. Next to that, I could be sharper during the first interviews to get more and better information about bike-sharing. During the process of interviewing, I got better at it. To prevent this, I could have made a more structured interview guide.

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Appendix 1: Interview guide (in Dutch)

1. Introductie en definities

- Kunt u uzelf voorstellen?
- Hoe definieert u deelmobiliteit? En bereikbaarheid? En de 'last-mile'?
- Wat zijn actuele mobiliteitsopgaven in uw gemeente? *Is er verschil tussen grote en kleine plaatsen in uw gemeente?*

2. Strategisch niveau – beleid

- Wat zijn in uw gemeente de beleidsdoelen/ambities voor deelmobiliteit?
- Wat zijn de ervaringen in de praktijk met deze doelen?
- Hoe kwam deelmobiliteit in uw gemeente tot stand? Hebben jullie daar zelf actief beleid voor gemaakt om zo aanbieders aan te trekken of zijn jullie benaderd? (door aanbieder/provincie).
- Hebben jullie ander beleid/opties om landelijke plaatsen in uw gemeente bereikbaar te maken/houden?
- Op welke manier kunnen deelfietsen volgens u bijdragen aan de duurzaamheidsdoelen van uw gemeente?
- Wat zijn in uw ogen de grootste barrières om een deelfietsnetwerk in te voeren in uw gemeente en landelijke gebieden?
- Kunnen deelfietsen iets toevoegen aan uw huidige fietsbeleid?
- Wie zijn/zullen de gebruikers zijn van deelfietsen in uw gemeente?
- Wat is het doel daarachter? Toeristen/bezoekers, lokale bewoners

3. Tactisch niveau

- Welke beleidsmiddelen gebruiken jullie nu om deelmobiliteit te bevorderen? In hoeverre zijn deze toereikend?
- Welke middelen gebruiken jullie of overwegen jullie te gebruiken?
- Hoe proberen jullie deze doelen te behalen?
- Denkt u dat door middel van beleid het gebruik van deelfietsen in landelijke gebieden aantrekkelijker kan worden?
- Zijn de resultaten van het huidige beleid al zichtbaar?
- Heeft uw gemeente contact met aanbieders van deelmobiliteit?
- Wie zijn de aanbieders met wie u contact heeft?
- Hoeveel ruimte zijn jullie bereid aanbieders te geven? Wat voor wetgeving/regels hanteren jullie? Hebben jullie ook een parkeerbeleid zoals stedelijke gemeenten hebben? Zouden jullie dit willen?

4. Uitvoering

- Welke vormen van deelmobiliteit zijn er op dit moment aanwezig in uw gemeente?
- Welke vormen willen jullie er graag bijhebben? *Waarom?*
- Wat is een project binnen uw gemeente waar succesvol deelfietsaanbod is gerealiseerd? Is er ook een project waar dit niet is gelukt? *En eventueel andere deelmobiliteit?*

5. Governance

- Werken jullie samen met de provincie/vervoersautoriteit (bijv. OVbureau) in het realiseren van deelmobiliteit?
- Welke taken hebben de partijen? (gemeente, aanbieders, provincie/OV bureau)
- Zouden jullie graag met andere overheden/instanties willen samenwerken, *in welke mate?*
- Zijn jullie bereid om samen te werken met andere aanbieders van deelmobiliteit?
- Wat voor samenwerking zouden jullie willen hebben?

6. Toekomst

- Denkt u dat deelmobiliteit (en deelfietsen in het bijzonder) een oplossing kan zijn voor toekomstige mobiliteitsproblemen? Hoe ziet u dat voor zich? En in de context van uw gemeente?
- Hoe ziet de toekomst van jullie mobiliteitsbeleid er uit?

Appendix 2: Codetree

Strategic level

- Collaboration
- National laws/regulations
- Transport policy
- Social policy
- Mobility standard
- Accessibility standard

Tactical level

- Fares
- Routes
- Timetables
- Enabling factors

Operational

- Sales
- Information
- Personnel
- Vehicle management

Transport

- Public transport
- Bike-sharing
- Car-sharing
- Transport policy
- Hubs
- Bike use
- *Personal car use???*
- Mobility as a service (MaaS)

Conditions

- liveability
- accessibility
- rural mobility
- sustainability
- Pressure on services?

Successes

Barriers

- Population density
- Promotion

Regulatory authority

- National laws
- Municipal laws
- Provincial laws

Transport authority

- Ov bureau policy (for example)
- Operators
- Demand based transport

Appendix 3: (Policy) Documents analyzed

Gemeente Aa en Hunze (2009). *Gemeentelijk verkeers- en vervoersplan Aa en Hunze*. Gieten: Gemeente Aa en Hunze

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