



# Car-sharing in Drenthe

A GIS-BASED APPROACH TO EXPLORE THE POTENTIAL

ROY BOERTIEN

Spatial Planning and Design  
Bachelor Thesis

# Colofon

**Title:** Car-sharing in Drenthe  
**Subtitle:** A GIS-based approach  
**Author:** Roy Boertien  
**Student number:** S3217531  
**Study programme:** Spatial Planning and Design  
Faculty of Spatial Sciences  
University of Groningen

**Contact details:** [r.e.boertien@student.rug.nl](mailto:r.e.boertien@student.rug.nl)

**Supervisor:** F. Bahrami

**Contact details:** [f.bahrami@rug.nl](mailto:f.bahrami@rug.nl)

**Date (Month/year):** June, 2019

**Version:** Final

**Illustration sources:** *Above:* Kwak, M. (2017). [https://www.dvhn.nl/drenthe/Drenthe-wil-als-oerprovincie-meer-toeristen-trekken-22572164.html?harvest\\_referrer=https%3A%2F%2Fwww.google.nl%2F](https://www.dvhn.nl/drenthe/Drenthe-wil-als-oerprovincie-meer-toeristen-trekken-22572164.html?harvest_referrer=https%3A%2F%2Fwww.google.nl%2F)

*Below:* Schreuder, A. (2015). <https://www.nrc.nl/nieuws/2015/06/03/autodelen-we-doen-het-niet-voor-het-milieu-maar-het-helpt-wel-a1496255>

## Abstract

In this research the potential of car-sharing in Drenthe is explored in a mixed methods approach. Based on GIS maps related to accessibility and socio-economic geographies, nine participants are select to gain information about how citizens perceive car-sharing. Ultimately, the outcomes of the interviews state that citizens are willing to embrace car-sharing. However, due to pragmatcal considerations they will not replace the regular car by a car-sharing service at the moment. Key is to examine in which specific cases the car has the greatest potential such as family households with more than one car. Furthermore, has the concept of car-sharing to be examined in the broader context of Mobility as a Service.

# Table of contents

Colofon.....	1
Abstract .....	2
Table of contents .....	3
Introduction .....	5
Background .....	5
Research problem .....	5
Research questions .....	5
Plan of research .....	6
Theoretical framework .....	7
The province of Drenthe.....	7
Accessibility .....	7
Socio-economic geographies.....	7
Car-sharing .....	8
Conceptual model.....	8
Academic and societal relevance.....	9
Hypothesis .....	9
Methodology .....	10
Choice of method .....	10
Quantitative data.....	10
GIS-data collection and analysis .....	10
GIS data reflection.....	11
Socio-economic data analysis and reflection.....	11
Qualitative data.....	11
Interview data analysis .....	12
Interview data reflection.....	12
Relation with the conceptual model .....	12
Ethical considerations.....	12
Quantitative research.....	13
Accessibility .....	13
Socio-economic geographies.....	15
Population density .....	16
Income per inhabitant.....	17
Amount of cars per household.....	18
WOZ-value (Value of a dwelling).....	19
Discussion of accessibility related to socio-economic geographies.....	20
Qualitative research.....	21

Discussion quantitative findings and interview findings.....	22
Results .....	24
Answering research questions .....	24
Advice for further research.....	24
Conclusion.....	25
References .....	26
Appendices .....	28
Appendix 1 Walking accessibility map.....	28
Appendix 2 Cycling accessibility map .....	29
Appendix 3 Information consent for participants.....	30
Appendix 4 Semi-structured interview questions.....	32
Appendix 5 Group coding table .....	33

# Introduction

In the introduction are the background of this research, the research problem, the research questions and the bookmark outlined. In short, provides this chapter an overview of the underlying aspects of this research.

## Background

In 2012 the Dutch government concluded that the level of accessibility, the time and costs per kilometre to reach a destination, was insufficient in the Netherlands (SVIR, 2012). Their future aim was to create one mobility network by 2040, in which all modes of transportation are combined into one coherent system. Now, seven years later, plenty of new innovative concepts have been introduced to improve the accessibility. One of those promising concepts, in line with the aim of the Dutch government, is 'Mobility as a Service'. MaaS its main target is to create a coherent mobility system with tailor-made solutions to ameliorate accessibility and increase connectivity (Mukhtar-Landgren et al., 2016). However, experts are facing difficulties establishing such a system. Dilemma's about economic vitality, spatial integration and institutionalization occur (Smith et al., 2018). Some cities have already found smart ways to adapt to this post-car world (Mees, 2010), whereas other cities struggle heavily with the phenomenon of 'Peak car' for instance (Cohen, 2012). Clear is that the seemingly unbeatable dominance of the car is diminishing (Urry, 2004; Newman & Kenworthy, 2015). In the Netherlands, the car still is the primary modality (KiM, 2019). Moreover, is the amount of cars growing steeply. As a consequence, congestion increases for example. Adaptation to new forms of mobility seem to be the solution to reduce current and upcoming mobility related issues. Within the scope of MaaS, car-sharing is one of those promising developments. Less cars on the road and more joint journeys will improve the accessibility.

## Research problem

Especially in rural areas in the Netherlands, smart mobility solutions do not seem to be realistic (KiM, 2018). Car-sharing services need to offer autonomy and flexibility, reliability and availability. Therefore, transitions are more likely to happen in urbanized areas.

Nevertheless, citizens in rural areas may be willing to reconcile themselves with new innovative modes of transportation to improve their accessibility. They are often dependent on cars and public transport in everyday life. Furthermore, lower population densities cause lower demand for public transport resulting in less public transport opportunities. This dystopian view related to the universal call of acceptable accessibility is creating serious issues of how to establish some kind of equal accessible mobility network.

Being the second most car-dependent province of the Netherlands (CBS, 2017) and seen as urban periphery (Strijker, 2003), the province of Drenthe offers interesting circumstances to investigate the potentials of innovative mobility developments. In particular, the potential of car-sharing. The aim of this research is to find out what the perceptions of citizens are towards this relatively new concept of car-sharing to explore the potential.

## Research questions

The central question of this research is in line with the main aim to examine the potential.

- To what extent are citizens of Drenthe willing to embrace car-sharing?

The first two secondary questions function as the basis for this research since their purpose is to assess the diversity within Drenthe and, consequently, help to select participants based on that diversity to enforce representativeness. The third secondary question focusses solely on car-sharing perceptions.

- How car-oriented is Drenthe?
- Which socio-economic geographies may influence travel behaviour?
- What perceptions of car-sharing exist among citizens of Drenthe?

## Plan of research

The first chapter of this research is the 'Introduction'. In this chapter the subject of study is introduced. The second chapter is the 'Theoretical framework'. This chapter explains the theoretical foundation relevant to the introduced subjects. In the third chapter the 'Methodology' will be explained. In more detail, the chapter clarifies how the data will be analysed and what the limitations of this research are. In the fourth and fifth chapter the quantitative and qualitative data will be presented and analysed. The sixth chapter discusses the outcomes of the analyses. The seventh chapter concludes the research and the tenth and eleventh chapters are the 'References' and the 'Appendixes'.

## Theoretical framework

The theoretical framework offers an explanation of the four important concepts of this research: the province of Drenthe, accessibility, socio-economic geographies and car-sharing, the conceptual model, the academic and societal relevance and the hypothesis. The province of Drenthe is the geographical entity and relevant since its car-orientation. As a matter of fact, car-sharing services attempt to reduce the usage of private cars. However, public transport accessibility, socio-economic factors and the service itself influence the perceptions of citizens. This is exactly the reason why they are described in more detail in this chapter and form the foundation of this research.

### The province of Drenthe

As mentioned earlier, Drenthe has a strong car-oriented focus compared to other provinces in the Netherlands. In their '*Provinciaal Verkeers- en Vervoersplan Drenthe: kaders en ambities 2007-2020*', the province of Drenthe (2007) outlines that the car will be the primary modality and the mobility network will be shaped to facilitate the car. However, in the trend towards more sustainable societies Drenthe actively participates. For example in Hogeveen, investigations are going on to examine the potentials of switching to hydrogen gas instead of using fossil fuels (Hoogeveensche Courant, 2019). This contrast between innovation and maintaining the status quo offers opportunities.

In general, rural areas tend to be more conservative in terms of maintaining the status quo (Nooij, 1996). Moreover, thoughts are that small villages merely exist out of close-knit societies (Gielsing et al., 2017). Nevertheless show several transitions that change in the rural landscape is not inconceivable and that some rural areas are developing faster than some urban areas (Strijker, 2006; SCP, 2008; De Voogd, 2017). As Woods (2009) points out, rural-urban linkages have become blurred. Although this change is happening, the rural representation will stay the same (Haartsen, 2002). Due to globalization this may not be completely valid. The perception of the rural identity may not radically change, but the identity can be influenced. As a result new rural identities are shaped (Haartsen et al., 2000).

Based on academic literature can be said that innovation will definitely take some time and effort. Willingness to adapt sustainable measures is not inconceivable. However, change will depend on smart bottom-up approaches.

### Accessibility

The term accessibility is nowadays widely-known and much research has been done to define and refine the concept of accessibility. According to the Dutch government (SIVR, 2012) accessibility means the effort in terms of costs and time that one person has to make to reach a destination from door to door. The concept has always been an interesting subject of discussion since its impact. In the early days of its existence, Hansen (1959) has already discovered a relation between land use and accessibility. Not surprisingly, do cities have a higher level of accessibility. On the contrary, in the urban periphery citizens need to rely more on a car or public transport since that is often the only useful mode of transportation. However, good public transportation clashes with economic viability. To increase accessibility for everyone, smart innovative mobility solutions are necessary.

### Socio-economic geographies

Widely-known is the importance of socio-economic geographies in case of explaining geographic differences. In this research focus is put on four socio-economic factors chosen for their expected relationship with the level of accessibility. Those factors are population density, income per inhabitant, amount of cars per household and WOZ-value (Value of a dwelling).

At first, population density matters in relation to accessibility. Due to economic unhealthy situations, busses will not travel through villages where every day ten people make use of the bus. In villages with higher densities probably more people will use the bus. Secondly, income affects the way people travelling. Having a car is expensive. On top of that is car fuel not cheap either. Both may cause that people prefer to travel by bus or by train. Thirdly, the amount of cars per household is relevant to identify which regions are really car-oriented. Higher numbers may pop up in regions where the accessibility is low. Finally, dwellings with high market values are in possession of people with a substantial amount of money. For that same reason, those people may not willing to do a bit more effort to take the bus or train and always use the car instead. In that case low accessibility is not an issue.

Important is to be aware of these possible relationships since they may affect the way people think about innovations and whether it suits them to alter current patterns of travelling. Why would people use car-sharing services instead of the regular car if they are satisfied with their current situation?

## Car-sharing

Since the invention of the car, one of the most fundamental principles of car-sharing had been set. This principle is the idea of sharing a vehicle. Examples are family members that are sharing a car or taxi's. But the concept of car-sharing goes further. Users do not share their own car(s), but all cars. With the help of an app on a mobile phone or computer the user can find the car closest to his location and hire that car. The main target is to benefit from the fact that most cars are not fully used all day. For that reason car-sharing reduces the total amount of cars and has positive effects on the environment (PBL, 2015). On top of that, do the annual individual costs for car-usage diminish (The Economist, 2010). However, car-sharing is not fully equipped in society today. Discussions about the embodiment of such a service are going on and transitions of travel behaviour take time.

Acknowledging the potential of car-sharing, still an enormous amount of factors affect the formation and success of the concept. Due to the complexity, Ferrero et al. (2018) have made an annotated review of 137 academic papers from the last fifteen years. Based on that paper, five categories are created to capture the perceptions of citizens. Those categories are service area, environmental concerns, ride-sharing, digitalization and constraints.

First of all, the service area is important due to the difference to park freely or in fixed stations. Secondly, more and more people and services take the environment into account nowadays. This may affect travel behaviour to the extent that people stop using the car for instance. Thirdly, the ride-sharing category focusses on joint journey travelling with other people. This idea goes beyond car-pooling and includes travelling with strangers instead of relatives. Fourthly, services become more digitalized causing exclusion. For example elderly are facing difficulties. Finally, shaping a car-sharing service is coping with constraints of how to implement such a concept.

It is still unknown if the idea of car-sharing will have success in the Netherlands and especially in rural areas. But the new concept may have positive effects. Taking into account the above described categories, the opportunity to create an unique network in the Netherlands exists. However, this depends merely on the willingness of citizens to adapt.

## Conceptual model

Figure 1 shows the conceptual model of this research. Most importantly are the three concepts central in the model. To clarify, these are accessibility, socio-economic geographies and car-sharing. In the chapter '*Methodology*' are the measurements of these concepts more precisely explained. The first concept accessibility will be measured in terms of public transportation accessibility to sharp the contrast between car-dependent areas and less car-dependent areas. As described in the paragraph '*Socio-economic geographies*', the factors above are used to give an indication of the existing socio-

economic geographies. Similar to socio-economic geographies, this is also applicable on car-sharing. In essence, the two concepts of accessibility and socio-economic geographies contain personal information which influence peoples point of view. In combination with the possibilities of car-sharing, this will result in diverse outcomes of the interviews and make clear what car-sharing components are crucial. Eventually, the interview findings can be used to affect the level of accessibility and may cause transitions in socio-economic geographies.

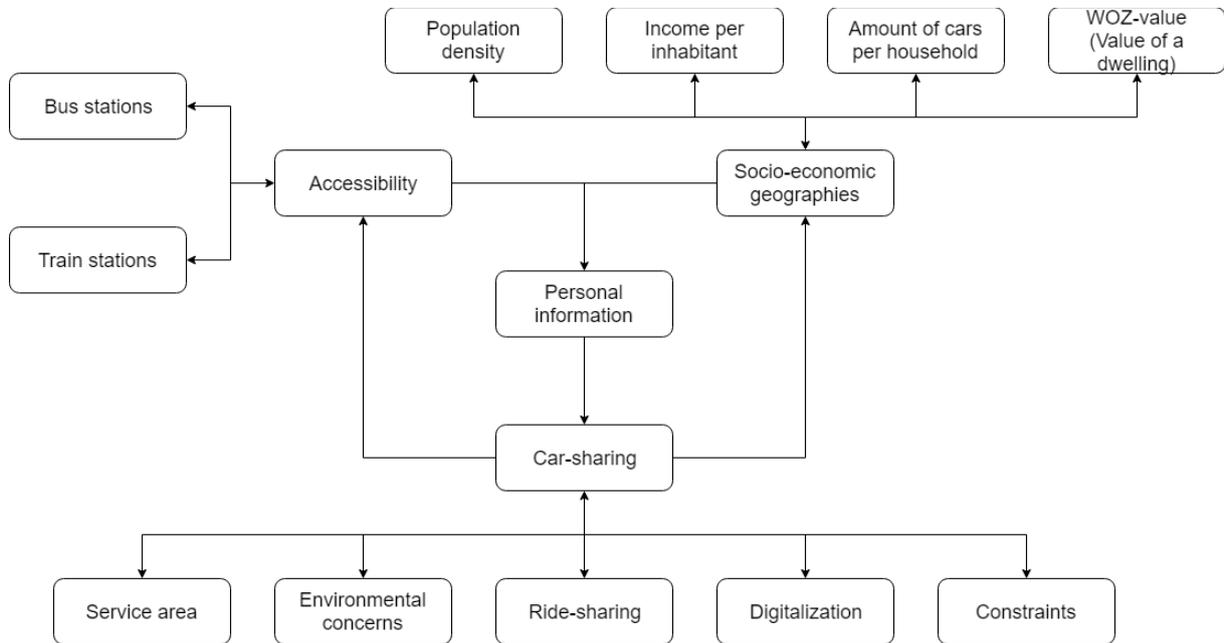


Figure 1. Conceptual model

## Academic and societal relevance

At the moment, car-sharing research in the Netherlands is limited. Qualitative research of the KiM (2018) focused on Mobility as a Service and in specific terms of car-sharing only quantitative analysis are available. There is a lack of in depth knowledge about how people perceive car-sharing. Therefore, is this research academically relevant.

The societal relevance is related to the service car-sharing provides. The in-depth knowledge will gain insights in the preferences of people that will help to design a better service. This stimulates the potential success. Moreover, interesting is to find out whether citizens of a car-oriented area are willing to replace their owned car or not. Eventually, the outcomes are useful to steer developments and services for society.

## Hypothesis

As described earlier, the close-knit societies in Drenthe can have the effect that citizens are not willing to adapt and maintain the status quo. However, the effect can also be that they are willing to adapt when relatives show the benefits of car-sharing usage. As a result, they hypothesis of this research is that citizens of Drenthe are willing to embrace car-sharing when sharing a car entails sharing a car with relatives.

# Methodology

In this chapter the methodology of this research will be discussed and explained. The methodology consists of the data analysis tools, quantitative and qualitative, that are being used including a data reflection. Also, are the link with the conceptual model and ethical considerations described in this chapter. The aim of the chapter is to clarify the reasoning underlying this research.

## Choice of method

The most important aim of this research is to find out how people perceive car-sharing to explore the potential. This aim indicates the choice for a qualitative research design. Nonetheless, are the perceptions not fixed. Many actors may influence how someone thinks about a particular subject. For that reason, does this research also contains a quantitative part. More specifically, accessibility and socio-economic geographies are taken into account to examine potential differences in perceptions. Firstly, an accessibility map will be created in GIS based on public transport location. Secondly, the accessibility map will be compared with socio-economic maps. Finally, based on the quantitative analysis' nine participants are selected and interviewed.

## Quantitative data

All the quantitative data has been derived from secondary sources. In GIS, the platform ArcGiS Online is used to find the necessary data. The socio-economic data is online available on the site of the CBS.

## GIS-data collection and analysis

Three datasets on ArcGis Online are used to perform a GIS network analysis to measure the accessibility within Drenthe. At first, the road infrastructure dataset. This includes all the roads that are in the specified region. Then, the locations of bus stations and train stations. The reason why to measure the accessibility in terms of access to public transport locations is to reveal the contrast between car-dependent regions and the alternative public transport accessible regions. For the development of car-sharing may this contrast have influence.

When the datasets are integrated in GIS, the network analysis tool helps to create polygons around the bus stations and train stations. The polygons consist of the walking and cycling costs. Based on academic literature, time restrictions have been set. Molster (2016) takes into account studies of maximum acceptable walking distances to bus and train stations. For the bus stations counts five minutes and for the train stations counts twelve minutes. In case of cycling are these breaks different. According to the City of Copenhagen (2013) the average cycling velocity is 16 km/h. In line with the maximum acceptable walking distance to bus stations, the maximum acceptable cycling time to bus stations is also five minutes. However, the cycling time to a train station is 25 minutes. Reason is that within a city with a train station most people are willing to cycle to the train station (KiM, 2017). With a maximum acceptable cycling time of 25 minutes almost all urbanized areas are captured. Table 1 shows the breaks. The areas where no polygons are created are considered as car-oriented.

Breaks	Bus stations (Walking)	Bus stations (Cycling)	Train stations (Walking)	Train stations (Cycling)
1	1	1	2,5	5
2	2	2	5	10
3	3	3	7,5	15
4	4	4	10	20
5	5	5	12,5	25

Table 1. Polygon breaks

The analysis of the produced map is primarily seeking patterns. The map will give indications whether areas are accessible, partially accessible or car-oriented. Given this determination, three categories of areas are being made. First of all, the areas which are well accessible. Those areas are close to train and bus stations within the time limits dictated. Second are the partially accessible areas. Those areas have an acceptable accessibility either for the bus or for the train. The last category is called car-dependent.

## GIS data reflection

The produced map will be of suboptimal quality due to technical and time-related issues. The frequency of busses and trains is not taken into account for instance. The map is just a plain representation of the accessibility measured in the costs of maximum acceptable time. Therefore, a more realistic map would reduce the accessibility levels. Also, since the costs in time differ, chosen is to overlay the walking maps of bus and train stations. In that case, the partially accessible areas can be noticed which may affect individuals travel behaviour. This counts also for the cycling maps. Unfortunately is this at the expenses of the clarity of the map. So, a map will be produced in which all the accessibility regions are clearly visualized. The last critical statement is about the time breaks. Those breaks are meant for generalization since younger people are capable of bridging longer distances in shorter time than elderly. This means as well that the breaks are not entirely representative for all the areas.

## Socio-economic data analysis and reflection

The socio-economic geographies that will be discussed and compared are population density, income per inhabitant, amount of cars per household and WOZ-value (Value of a dwelling). The geographies are considered interesting due to their possible influence on travel behaviour in Drenthe. Noteworthy to mention is that the accessibility map and the socio-economic maps are compared visually, so statistical tests are not used.

Of course, the analysis of socio-economic data will not provide certainties due to generalizations. However, the analysis may give indications which are relevant for further research. In the interview questions some of the socio-economic factors return.

## Qualitative data

The qualitative data will be gathered through interviews and, consequently, coding. Nine participants are anonymously interviewed. The participants are selected based on level of accessibility and age. The level of accessibility are well accessible, partially accessible and car-oriented. The age groups are below 25, 25 till 55 and above 55. In this way, the results represent different points of view which will increase the credibility. The kind of interview is semi-structured (Appendix 4). A semi-structured interview is an interview in informal setting created to shape a dialogue between the interviewer and the participant (Clifford et al., 2010). The participants of this research have different demands due to the situation they are in. This may affect the way in which the interview moves on and also leaves space to gather unforeseen information. Based on the academic paper of Ferrero et al. (2018), the earlier introduced categories have been created. To clarify, these categories are service area, environmental concerns, ride-sharing, digitalization and constraints.

Before the interviews a coding system has been created to analyse the qualitative data. This coding system is very important for the qualitative method used in this research. This method is called grounded theory. Grounded theory entails that theory is generated from the collected data (Punch, 2014). In order to find out the perceptions of citizens, this method is the most suitable. However, not all the data is deductively coded. Punch (2014) emphasizes that this deductive logic stresses with the inductive nature of grounded theory. This is the reason why some data, such as the data in the constraints category, is inductively retrieved.

## Interview data analysis

Based on the level of accessibility and the age of the participants, the qualitative data will be analysed. In case three participants of either level of accessibility or age share equal outcomes, the specific code is added to the table of findings. For example, three participants of <25 are car-owner, then car-ownership will be added to the outcome table of <25. With the help of atlas.ti, frequencies are calculated.

## Interview data reflection

Honestly, the nine participants may not give a representative image of the society as a result of the low number. However, the participants are all selected based on different points of view. Moreover, will not all concepts be discussed equally since participants tend to have more affection with the factors involved they encounter in real life. Concluding, the research may not give a completely representative image, but with the chosen methodology an attempt is made to unfold the unknown.

## Relation with the conceptual model

In fact, the conceptual model explains the methodology. The influence of the accessibility on socio-economic geographies will be analysed. Lower accessibility will perhaps, in this case, lead to a higher average number of cars per person. The other factors share equal assumptions. The interview itself will be based on the important factors of car-sharing and personal information. Eventually, the outcomes of the interviews may present incredibly important information that this causes changes in the accessibility. Lower accessibility for that matter will be equivalent to higher car-dependence resulting in more opportunities for car-sharing.

## Ethical considerations

According to the KNAW (2018) five guiding principles are essential for the integrity of research: honesty, scrupulousness, transparency, independence and responsibility. In this research the methodology has been explained in detail to follow the guiding principles of integrity. Collected data has been carefully studied to avoid issues with credibility and legitimacy. After ethical evaluation, little privacy sensitive struggles appeared. More precisely, three struggles appeared. First, the name of the participant. Including the name will give direct information about who the participant is. Second, the name of the home town of the participant. In areas with low densities participants may be traced back easily. Third, the information participants give can be harmful for themselves or others.

The first issue is tackled by not including the name of the participant in the research, unless this is approved by the participant. The second issue is solved by placing participants in the accessibility categories mentioned earlier. The last problem will be solved by letting participants signing an information consent (Appendix 3). With the above standards, the information will be held in confidence and the participants are anonymized.

# Quantitative research

In this chapter the quantitative data will be analysed with the help of GIS-created maps. Figure 2 shows a topographic map of Drenthe in order to give an indication of the environment and sense of location. The other maps presented in this research will be centred more on the province of Drenthe. To highlight, the red dots represent the places with train stations.

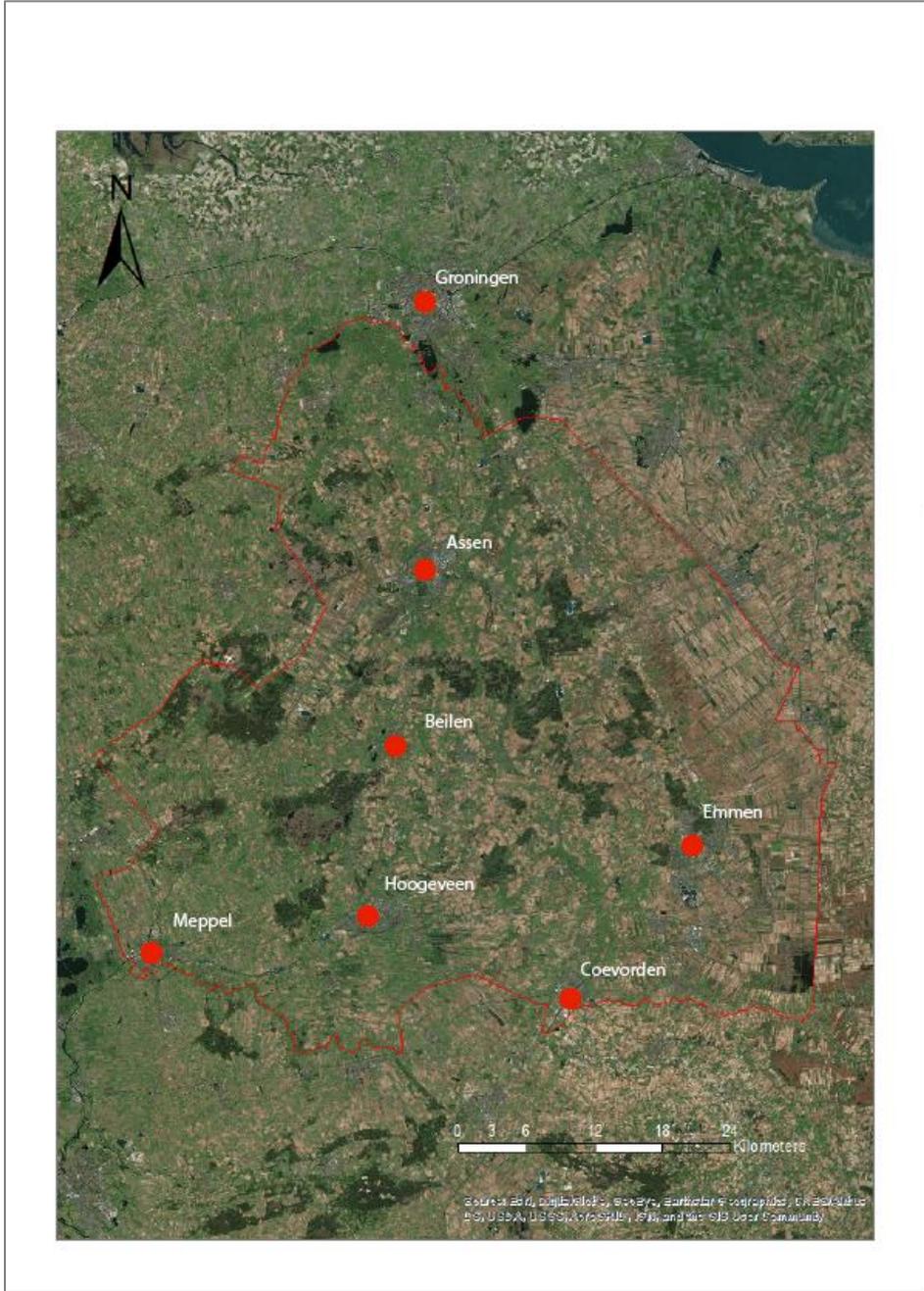


Figure 2. Topographic map of Drenthe

## Accessibility

In ArcGis three maps have been created with respect to the accessibility of public transport. The first map entails the walking accessibility (Appendix 1) and the second map is about the cycling accessibility (Appendix 2). Appendix 1 shows clustering and diversity. The more urbanized areas have

greater capacities of public transportation locations. In the other areas the pattern exists of bus stations along roads. Remarkable is the diversity within urbanized areas. Apparently, some neighbourhoods are more excluded from access to public transport than others. For elderly this is far from ideal. The reasoning for this variance is related to the cycling accessibility. Even though particular areas are not accessible by foot, they are accessible by bike according to appendix 2. A clear phenomenon can be seen in case of cycling accessibility. The maximum acceptable cycling distance captures the whole urbanized areas. As stated earlier, urban policies have the aim to provide good accessibility through one modality or another. But outside these boundaries, the lack of accessible public transport is real.

The inhabitants of smaller villages rely on the bus, bicycle or car to go from A to B. Train stations are often too far away to reach by bicycle. Along the roads between villages, seemingly, citizens have or do not have the luck that bus stations are close to their dwellings. This situation creates that long distance travel will be done by car or bus, whereas the bicycle or the car will be used for short distance travel.

Based on the walking and cycling accessibility, figure 3 represents the overall image of accessibility. The figure is in line with the outcomes above. Still, most areas in Drenthe are considered car-oriented due to their lack of public transport. In case of the partially accessible areas, claims about car-orientation have to be made with more carefulness. Those areas are located directly next to the villages with train stations or on another location with good bus accessibility. Implicitly, those areas are vulnerable of the tendency between car-usage or not. However, the areas which are not located next to a village with a train connection can be considered more car-oriented.

So, all in all, the walking accessibility map (Appendix 1) shows that walking accessibility is limited and depends on localization of bus and train stations, whereas the cycling accessibility map (Appendix 2) shows a contrast between villages with train stations and villages without train stations. Figure 3 clarifies this representation. Eventually, the villages which do not have a train station or areas which are not directly next to villages with train stations are considered car-oriented.

## Level of accessibility

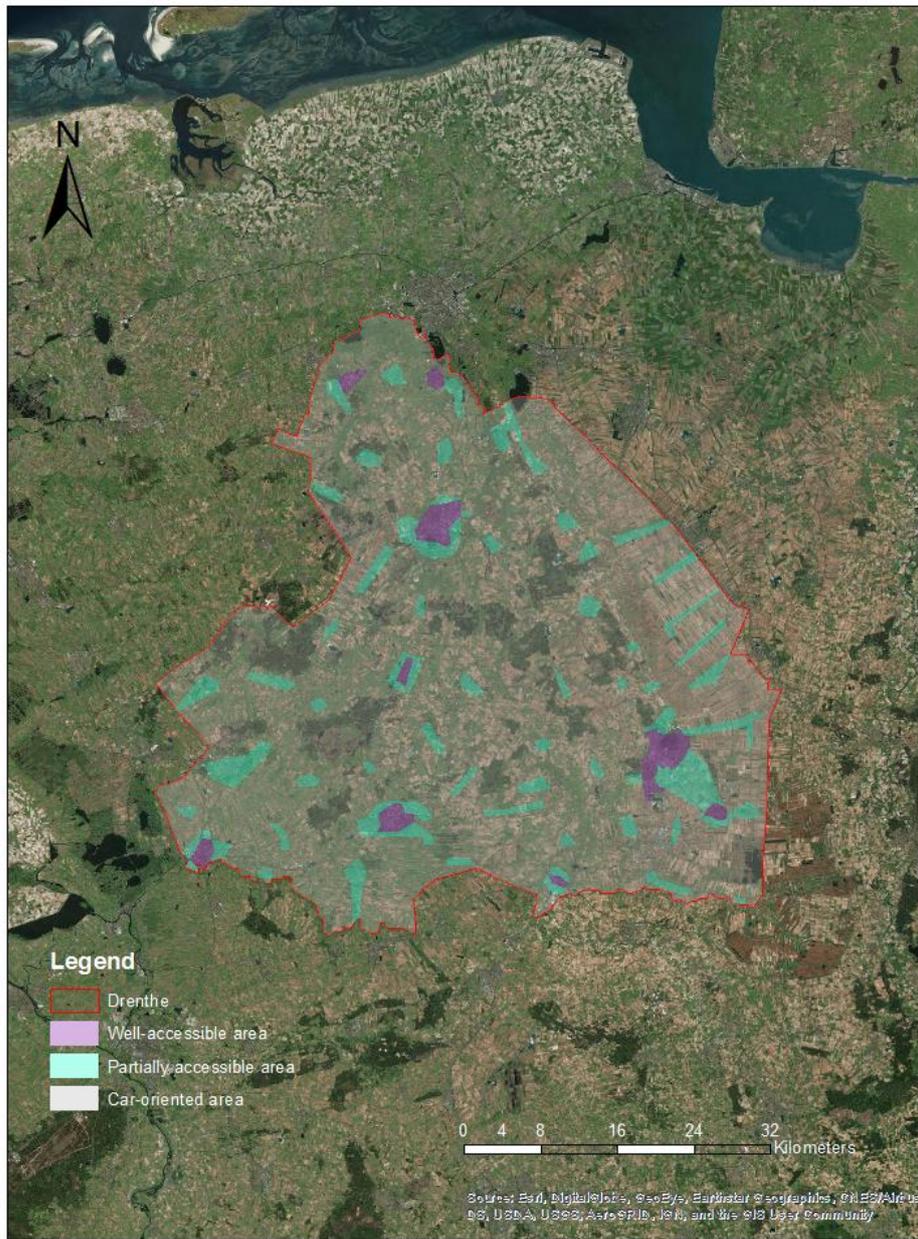


Figure 3. Level of accessibility

### Socio-economic geographies

In the chapters of the *'Theoretical framework'* and the *'Methodology'*, the chosen socio-economic geographies are highlighted and, briefly, explained their reasons why they could influence accessibility or why accessibility influences them. In isolation, the four factors will be discussed at first.

## Population density

The four main villages Assen, Emmen, Hoogeveen and Meppel are the most densely populated. Often, directly outside the borders of these villages the population density level changes radically. Clear-cut boundaries between the urban and the urban periphery are illustrated (figure 4). Consequently, this has an impact on the mobility network of Drenthe. The explanations for those areas are land-use specific. One the hand, does protected nature hinder sprawl. On the other hand, does agriculture the exact same thing. Developments in the build environment are therefore restricted and directed.

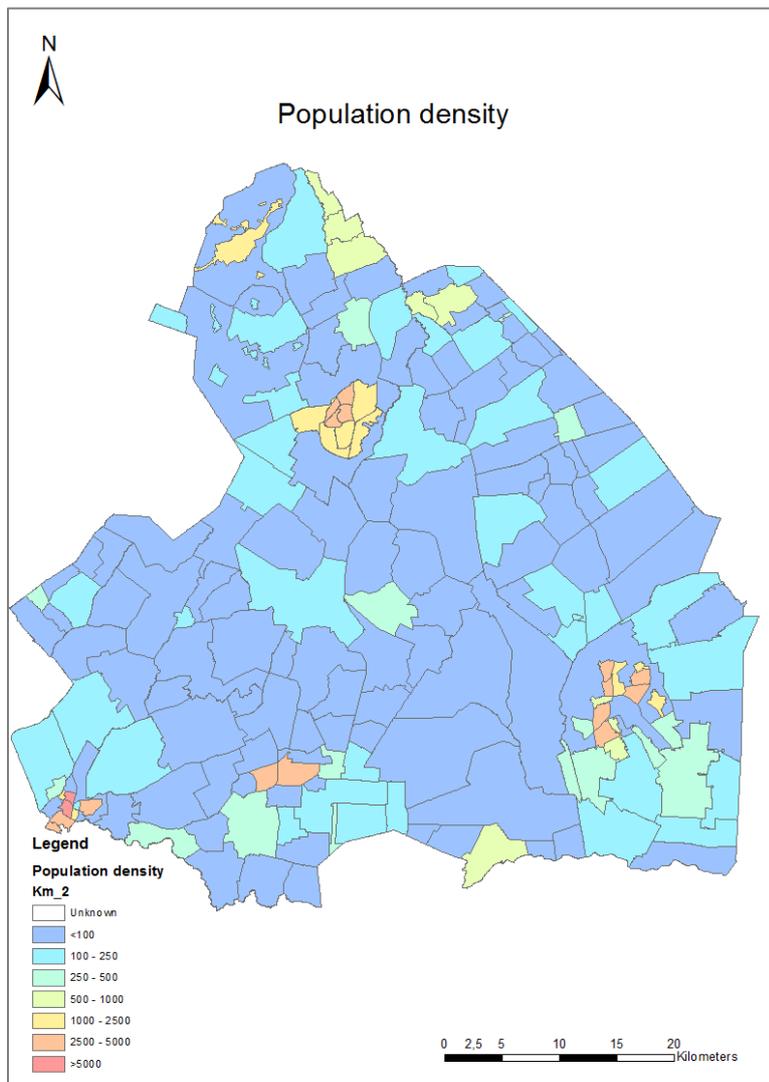


Figure 4. Population density in Drenthe

## Income per inhabitant

The map (figure 5) shows that in the south of Drenthe the income per inhabitant is remarkably low compared to other regions. One reason is that the village of Hogeveen has always been village where relatively many working class people live. Excavation of peat and industry have determined the landscape of Hogeveen for a long time (Geheugen van Drenthe, 2019a). Besides that part of Drenthe, more interesting outcomes are presented. In the villages of Assen and Emmen great variety exists between income levels. Clearly some neighbourhoods have higher income levels than others. Considerably important as well is the pattern of income in the direction of the city of Groningen. Probably people who work in Groningen tend to live in the municipalities a bit further away. The same goes for Assen. An exception is the area close to Haren which is famous for its rich elderly.

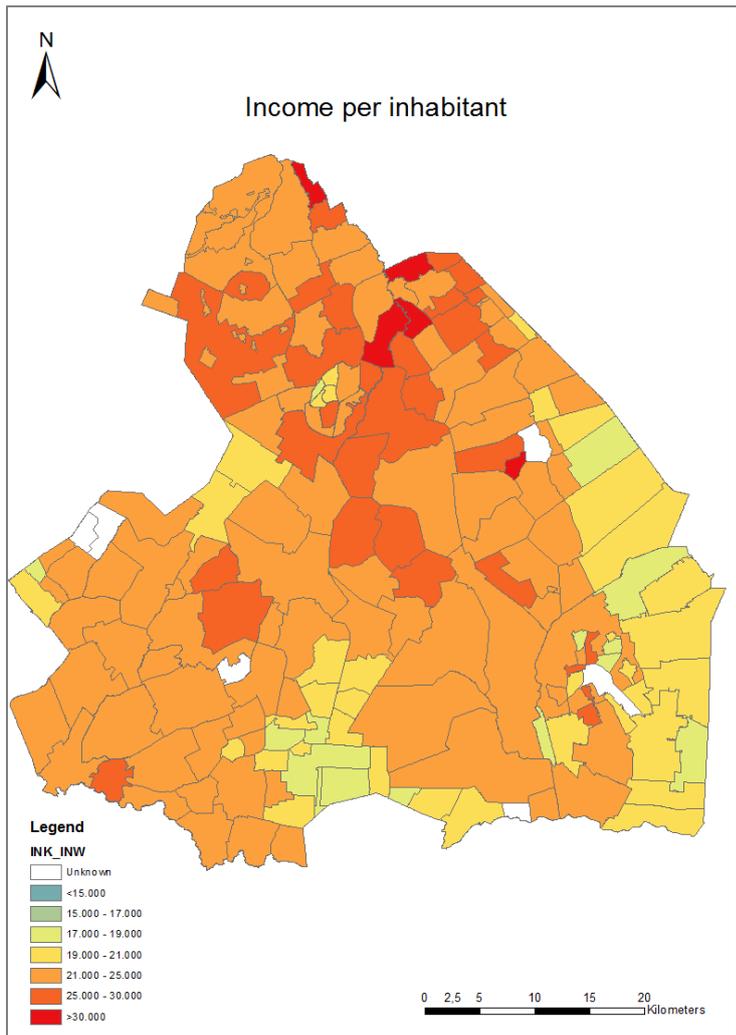


Figure 5. Income per inhabitant

## Amount of cars per household

In the map (figure 6) the more urbanized areas spring out clearly. Apparently, the need for a car is lower in the urbanized areas in Drenthe then in the surrounding areas. The car-dependent areas are located more or less in between the villages. The influence of accessibility may be one of the factors influencing the difference in car-dependency.

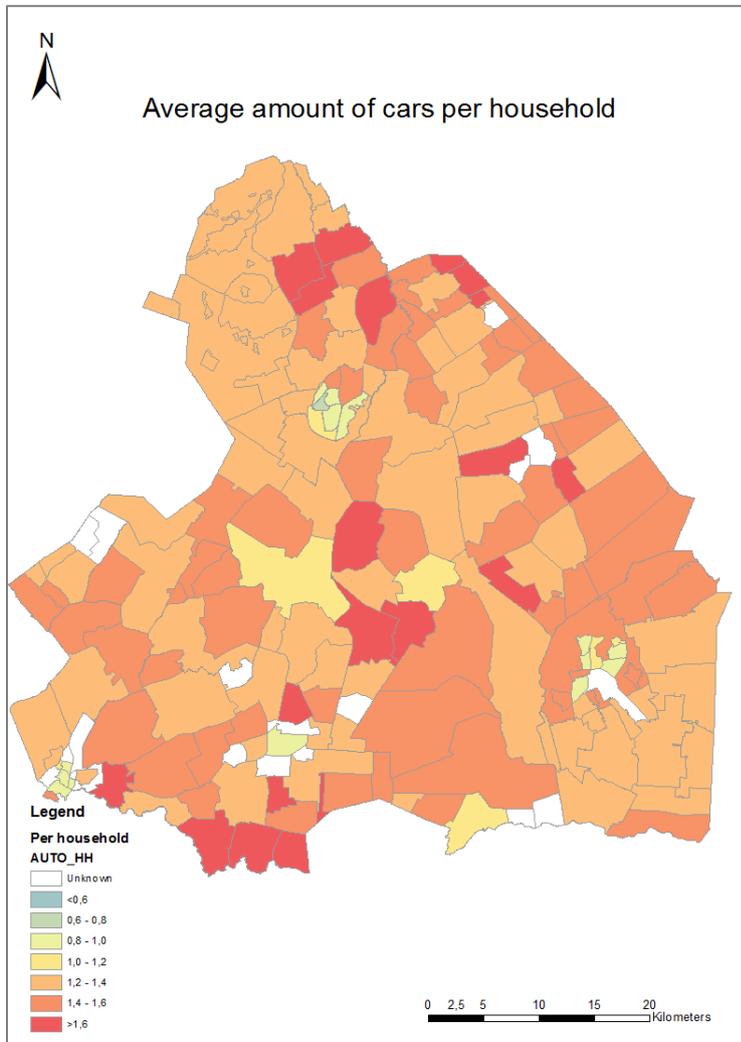


Figure 6. Amount of cars per household

## WOZ-value (Value of a dwelling)

Whereas the trend of re-urbanization is actual in cities, in the villages of Drenthe revitalizing and gentrification of neighbourhoods has not led to an increase in the average WOZ-value. It is in the neighbourhoods around the city itself where, generally, the WOZ-value is the highest (figure 7). So, suburbanization is still actual in Drenthe.

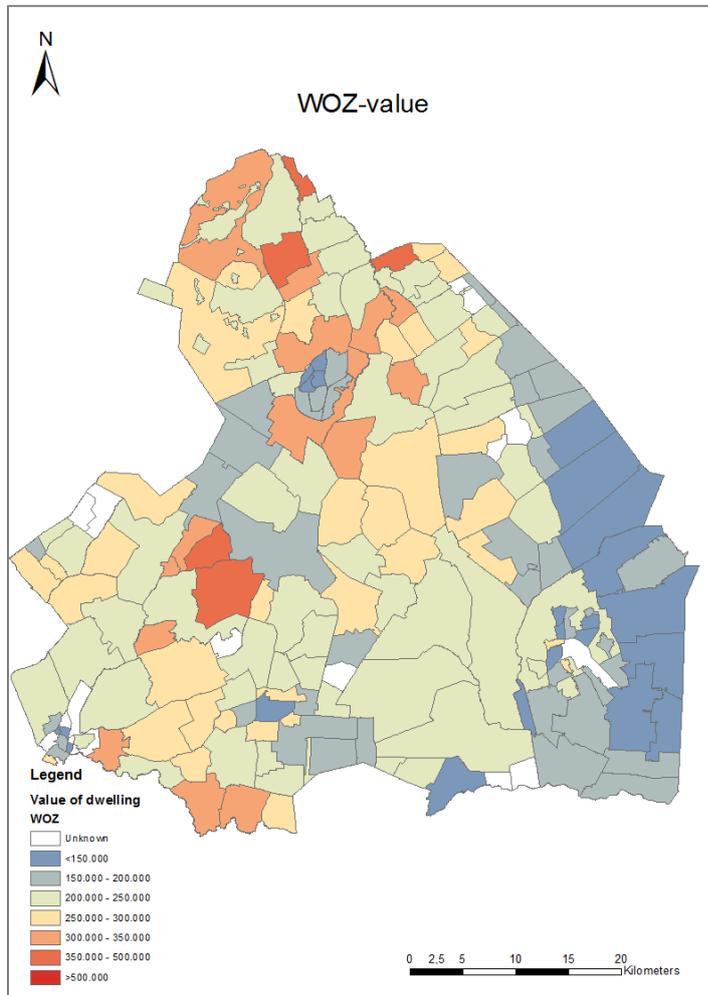


Figure 7. WOZ-value

## Discussion of accessibility related to socio-economic geographies

Not surprisingly is the population density high in the more accessible areas than the more car-oriented areas. Nevertheless, are also some average populated areas well-accessible. Apparently, the density of the population does not entirely explain the level of accessibility. However, the areas between the bigger villages are not densely populated and predominantly car-oriented. So, population density has to some extent influence on the accessibility.

Except from the Mid-South of Drenthe, the level of income has comparisons with the accessibility. Especially with the cycling accessibility. The areas directly around the villages with train stations tend to have the highest income in general. Within the village or at some distance from the villages the level of income is lower. In line with the map, suburbanization is still actual. The inhabitants struggle with the dilemma of using the car, the bus or the bicycle.

Important is to compare this phenomenon with the amount of cars per household. There is a clear pattern that within villages with train stations the amount of cars is considerably lower than the areas without train stations. Even in the areas where bus stations are well-accessible, the amount of cars are equivalent to areas where the accessibility is low. Most importantly, the train functions as a replacement for the car in villages with train stations.

Finally, the relation between the WOZ-value and the accessibility is not clear. In the main villages Assen, Emmen, Hogeveen and Meppel the WOZ-value is low, but those villages are well-accessible. In line with the level of income of those villages, citizens may not have the financial capacity to possess a car and prefer other modes of transportations. But, around those main villages no clear line can be found. This mosaic makes it difficult to make assumptions.

To sum up, the assumptions can be made that population density, income per inhabitant and the amount of cars per household relate to the level of accessibility and consequently affect the travel behaviour of citizens in Drenthe.

## Qualitative research

In this chapter the qualitative findings are analysed based on level of accessibility and age. The tables provide all the relevant codes which are entitled to the participants in a specific category.

In table 2 the main findings are that the dominance of the car is still actual, participants travel within their living environment, a diversity in public transportation exists and participants are convenience travellers. Important is the fact that public transportation does not encourage other modes of transportation. Clearly, the car is the predominant modality uninfluenced by level of accessibility. Nevertheless, there is a relationship between level of accessibility and public transport satisfaction. As the citation below points out, the lack of public transportation directly influences the mode of transportation.

*'The bus and train stations are so far away that I have to rely on the car. Otherwise am I not able to live my everyday life due to the unpracticalities' (Male, <25, car-orientend area)*

Even in well-accessible areas, the opportunities of public transportation are limited as the citation below clarifies.

*'In case of work am I not able to use public transportation since I need my equipment every day'.* (Male, 25-60, well-accessible area)

The above is creating the differences in satisfaction about public transportation. Two other things which are of essence to this attitude and relevant for car-sharing is that the participants merely travel within their living environment and are convenience travellers. This is not dependent on level of accessibility as well as age.

*'The only time I need to travel a long distance is when I have to go to the hospital. That will take approximately 30 minutes and I am using the car since that is the easiest option (Female, >60, partially-accessible area)*

*'I do not have to travel long distance. My work, my friends and my family are all close to where I live' (Female, 25-60, car-oriented area)*

Level of accessibility	Main results
Well-accessible area	<ol style="list-style-type: none"> <li>1. Predominant car and bicycle user</li> <li>2. Do not rely on the car</li> <li>3. Travel within their living environment</li> <li>4. Satisfied about public transportation</li> <li>5. Money does not influence travel behaviour</li> <li>6. High digital skilfulness</li> <li>7. Consider car-sharing</li> </ol>
Partially accessible area	<ol style="list-style-type: none"> <li>1. Varied usage of modes of transportation</li> <li>2. Travel within their living environment</li> <li>3. Mixed satisfaction of public transportation</li> <li>4. Time influences travel behaviour</li> <li>5. Sceptical about ride-sharing</li> </ol>
Car-oriented area	<ol style="list-style-type: none"> <li>1. Depend on the car</li> <li>2. Travel within their living environment</li> <li>3. Not satisfied about the public transportation</li> <li>4. Travel alone</li> </ol>

Table 2. Main results based on level of accessibility

Within the view of age, table 3 shows that, logically, that travelling within the living environment and convenience travelling are relevant findings. Moreover, reveals the table the dominance of the car in a different perspective. The age categories <25 and 25-60 contain both more than one car per household and travelling alone.

Age	Main findings
<25	<ol style="list-style-type: none"> <li>1. Varied usage of modes of transportation</li> <li>2. More than one car per household</li> <li>3. Travel frequently within and outside their living environment</li> <li>4. Money and time influence travel behaviour</li> <li>5. Travel alone</li> <li>6. Consider ride-sharing with pre-obtained information</li> <li>7. Mobile or computer dependent</li> <li>8. High digital skilfulness</li> </ol>
25-60	<ol style="list-style-type: none"> <li>1. Car-users</li> <li>2. More than one car per household</li> <li>3. Travel within their living environment</li> <li>4. Travel alone</li> <li>5. Do not consider ride- and car-sharing at the moment</li> </ol>
>60	<ol style="list-style-type: none"> <li>1. Travel within their living environment</li> <li>2. Money and time do not influence travel behaviour</li> <li>3. Travel less than 15 minutes almost any time</li> <li>4. Do not depend on the mobile or computer</li> </ol>

Table 3. Main findings based on age

## Discussion quantitative findings and interview findings

Clearly, the usage of public transportation is limited. Even in well-accessible areas and partially accessible areas, the dominance of the car remains. Bus stations tend to be the least popular alternative for the car. Reason for this is the fact that most participants travel within their living environment and the car is the most convenient mode of transportation for them. Surprisingly, no clear link can be distinguished between accessibility and socio economic geographies compared to the perceptions of citizens. Most likely, the premature phase of car-sharing causes that participants share equal perceptions.

Although one participant explicitly stated that he will not consider car-sharing as an alternative, the other eight participants mentioned that they are willing to think about car-sharing. Especially for the age groups <25 and 25-60, car-sharing can be a realistic alternative since they possess more than one car and travel often alone.

However, within the province of Drenthe car-sharing is facing threats. Since the demand for car-sharing can be limited, the supply can be limited as well. Especially in a rural context, this situation is not unrealistic. Therefore, is car-sharing more likely to happen in the more densely populated villages.

The concept of ride-sharing may solve this issue to some extent in Drenthe. De province of Drenthe is famous due to its cultural landscape with for instance ‘mysterious’ dolmens (Province of Drenthe, 2016). Similar to the stones in Stonehenge, some dolmens in Drenthe serve also the purpose of ritual proceedings. However, other dolmens have served the purpose of being a tomb (Geheugen van Drenthe, 2019b). Unfortunately, only the relics have survived. Thoughts are that closely connected people such as family and friends buried the relics to give the dead person materials in the life after. This very old idea of caring for a beloved person is still appearing to some extent in communities in

Drenthe. What if the dolmens are functioning as cars? All participants stated that they are willing to share a ride with people they know. This brings opportunities for ride-sharing in line with car-sharing. Perhaps, the start of car-sharing usage has to be restricted to the local environment to increase awareness and popularity.

## Results

In this chapter are the main results presented based on the discussions in the previous chapters. Simultaneously, the research questions will be answered as far as possible. Recommendations for further research will be mentioned in the last paragraph.

### Answering research questions

The secondary research questions stated at the beginning of this research are:

- How car-oriented is Drenthe?
- Which socio-economic geographies might influence travel behaviour?
- What perceptions of car-sharing exist among citizens of Drenthe?

In chronological order the above are answered. First of all, the car-orientation of regions. According to the GIS-map, predominantly the areas which do not have a train station rely more on the car. The bus is not real competition for the car. However, the interviews show that this image of car-orientation is not fully representative. Even in well-accessible and partially-accessible areas, the dominance of the car is still reality.

Secondly, the four factors chosen do not all seem to influence travel behaviour. Population density, income per inhabitant and amount of cars per household are stimulating the way of travel behaviour. The WOZ-value has not a clear impact on the way of travelling. In case of car-sharing, the influence of socio-economic geographies is unclear due to the premature phase of the concept.

Finally, citizens of Drenthe think that car-sharing can be an alternative. However, do they state it is not likely that they will use the service. The success of car-sharing will depend on the design of the provided service, the convenience of the service and the travel costs to establish shifts in travel behaviour. All in all, citizens perceive car-sharing as inconvenient and not realistic at the moment.

The central question of this research was:

- To what extent are citizens of Drenthe willing to embrace car-sharing?

At the moment, citizens of Drenthe are willing to embrace car-sharing to a pragmatic extent. They see the opportunities it can bring. However, they are not considering car-sharing as a replacement of the car. Mostly, because of the inconvenience it will bring for them due to several reasons. In the future, car-sharing as part of the umbrella concept of MaaS has the greatest potential.

### Advice for further research

Many researchers examined the concept of car-sharing (Ferrero et al., 2018). But, in practice is the concept premature. Citizens still prefer car-ownership due to its freedom. In order to benefit from the not used cars every day, car-sharing has to benefit from the weaknesses of the car. To a certain extent has car-sharing advantages and key is to develop these advantages. Unfortunately in rural areas this is not realistic. Therefore, research regarding self-driving cars is needed. Car-sharing in combination with self-driving cars has the potential to overcome the unrealistic situation.

## Conclusion

The importance of accessibility has been well-documented in this research. Not only the Dutch government wants to improve the accessibility, but also citizens benefit from well accessibility. Within the scope of Mobility as a Service, car-sharing is one service which can help to increase the level of accessibility. But, inhabitants of the Netherlands have to reconcile themselves with the loss of car-ownership. In the car-oriented province of Drenthe accessibility is of great importance. According to the GIS-based accessibility maps, public transport is not everywhere equally accessible or not efficient to use. The car covers this gap, but can also be used more efficiently. The bottleneck is are citizens willing to adapt to changes like car-sharing. Compared socio-economic factors explain that differences in accessibility are related to some extent to population density, income per inhabitant and amount of cars per household. This creates varied perceptions of how people think about alternatives in mobility. Based on accessibility, four main findings have been presented. These are the dominance of the car, the mixed satisfaction of public transport, travelling within the living environment and convenience travelling. Based on age, also four main findings have been presented. These are more than one car per household in the age groups <25 and 25-60, travelling alone, travelling within the living environment and convenience travelling. These findings support the conclusion that car-sharing as a replacement of car has potential for the future. However, citizens of Drenthe are not considering car-sharing at the moment. Essential is to explore where car-sharing can serve as a replacement such as in families with more than one car.

## References

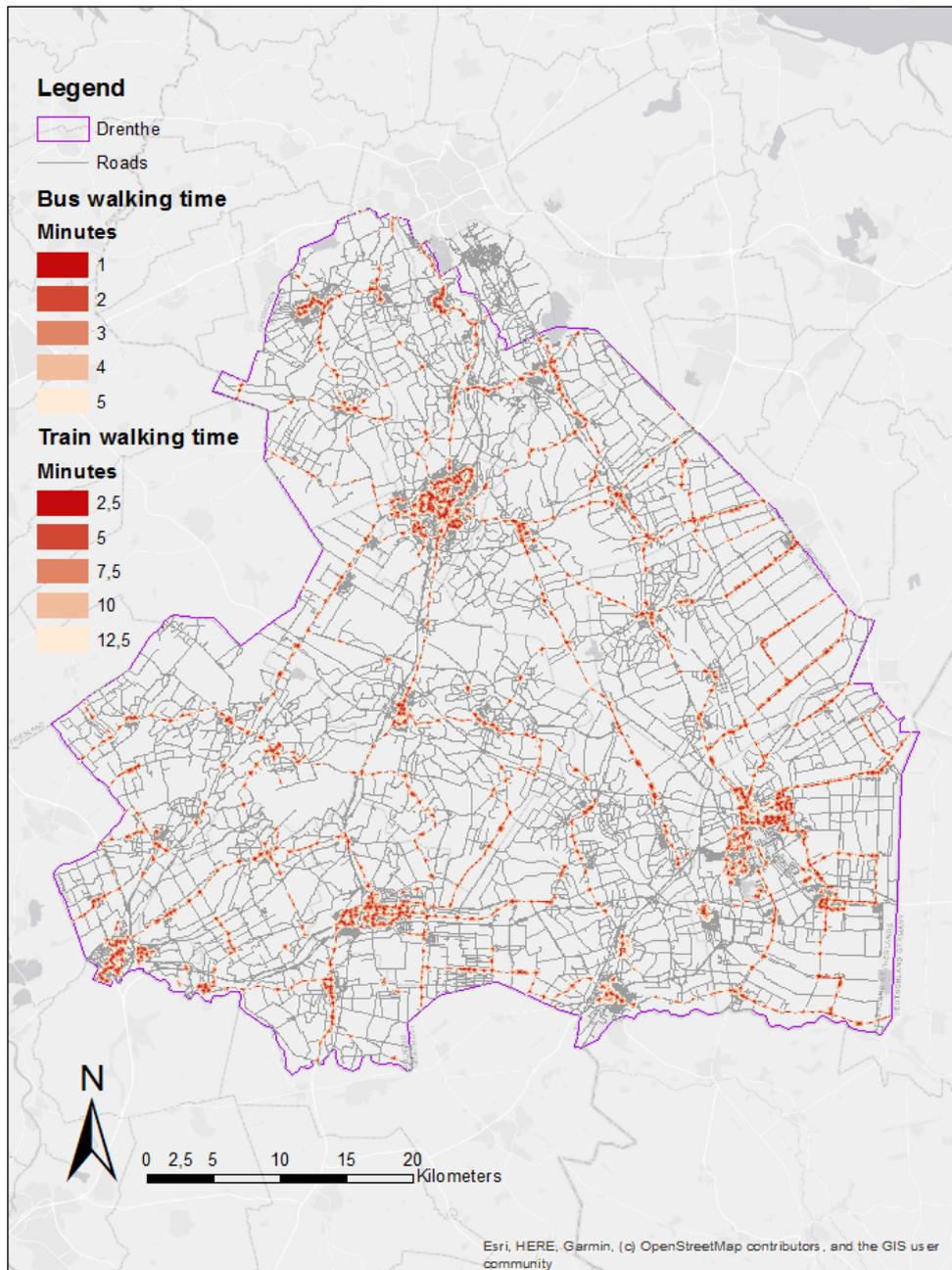
- CBS (2017). *Forse groei autokilometers*. Retrieved on 1 May, 2019 from <https://www.cbs.nl/nl-nl/nieuws/2017/41/forse-groei-autokilometers>
- City of Copenhagen (2013). *Bicycle statistics*. Retrieved on 10 April, 2019 from <https://web.archive.org/web/20131212093813/http://subsite.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/LivingInCopenhagen/CityAndTraffic/CityOfCyclists/CycleStatistics.aspx>
- Clifford, N., French, S. and Valentine, G. (2010). *Key Methods in Geography*. 2th Edition. London: Sage
- Cohen, M.J. (2012) The future of automobile society: a socio-technical transitions perspective. *Technology Analysis & Strategic Management*, 24 (4), p 377-390
- Ferrero., F., Perboli., G., Rosano., M. & Vesco., A. (2018). Car-sharing services: An annotated review. *Sustainable Cities and Society*, 37, p 501-518
- KiM (2017). *Mobiliteitsbeeld 2017*. Den Haag: Kennisinstituut voor Mobiliteitsbeleid
- KiM (2018). *Meer zicht op Mobility-as-a-service: inzichten uit literatuur en focusgroepgesprekken*. Den Haag: Kennisinstituut voor Mobiliteitsbeleid
- KiM (2019). *Kerncijfers Mobiliteit 2018*. Retrieved on 30 April, 2019 from <https://www.kimnet.nl/mobiliteitsbeeld/kerncijfers-mobiliteit-2018>
- KNAW (2018). *Netherlands Code of Conduct for Research Integrity*
- Geheugen van Drenthe (2019a). *Hoogeveen*. Retrieved on 9 May, 2019 from <https://www.geheugenvandrenthe.nl/hoogeveen>
- Geheugen van Drenthe (2019b). *Hunebedden*. Retrieved on 6 May, 2019 from <https://www.geheugenvandrenthe.nl/hunebed>
- Gieling., J., Vermeij, L. & Haartsen., T. (2017). Beyond the local-newcomer divide: Village attachment in the era of mobilities. *Journal of Rural Studies*, 55, 237-247
- Haartsen., T. (2002). *Platteland: boerenland, natuurterrein of beleidsveld? Een onderzoek naar veranderingen in functies, eigendom en representaties van het Nederlandse platteland*. Groningen: Rijksuniversiteit Groningen
- Haartsen., T., Groote., P. & Huigen., P.P.P. (2000). *Claiming Rural Identities: Dynamics, Contexts and Policies*. Assen: Van Gorcum
- Hansen, W.G. (1959) How Accessibility Shapes Land Use. *Journal of the American Institute of Planners*, 25 (2), p 73-76
- Hoogeveensche Courant (2019). Hoogeveen: Erflanden ook op waterstofgas. Retrieved on 10 March 2019 from [https://www.hoogeveenschecourant.nl/nieuws/hoogeveen/993518/erflanden-ook-op-waterstofgas.html?harvest\\_referrer=https%3A%2F%2Fwww.google.nl%2F](https://www.hoogeveenschecourant.nl/nieuws/hoogeveen/993518/erflanden-ook-op-waterstofgas.html?harvest_referrer=https%3A%2F%2Fwww.google.nl%2F)
- Mees, P. (2010). *Transport for Suburbia: Beyond the Mobile Age*. London: Earthscan
- Molster, A. (2016), *De rol van de voetganger in het mobiliteitssysteem van Nederland*. Arnhem: Molster Stedenbouw

- Mukhtar-Landgren, D., Karlsson, M., Koglin, T., Kronsell, A., Lund, E., Sarasini, S., ... Wendle, B. (2016). Institutional conditions for integrated mobility services (IMS): Towards a framework for analysis (*K2 Working Papers 2016*, 16). Lund: Swedish Knowledge Centre for Public Transport
- Newman, P., & Kenworthy, J. (2015). *The end of automobile dependence: how cities are moving beyond car-based planning*. Washington, DC: Island Press
- Nooij, A. (1996). Rural Sociologie, een buitenplaats van de algemene sociologie. *De Sociale Gid*, 43 (1), p 6-16
- PBL (2015). Impact of car sharing on mobility and CO2 emissions. *PBL note*
- Province of Drenthe (2016). *Cultuurnota 2017-2020: de verbeelding van Drenthe*. Assen: Province of Drenthe
- Province of Drenthe (2017). *Provinciaal Verkeers- en Vervoersplan Drenthe: Kadern en ambities 2007-2020*. Assen: Province of Drenthe
- Punch, K. (2014). *Introduction to Social Research: Quantitative & Qualitative Approaches*. 3th Edition. London: Sage
- SCP (2008). *Het platteland van alle Nederlanders: hoe Nederlanders het platteland zien en gebruiken*. Den Haag: Sociaal en Cultureel Planbureau
- SIVR (2012). *Samenvatting Structuurvisie Infrastructuur en Ruimte*. Den Haag: Ministerie van Infrastructuur en Milieu
- Smith, G., Sochor, J. and Sarasini, S. (2018). Mobility as a service: comparing developments in Sweden and Finland. *Research in Transportation Business & Management*, 27, p 36-45
- Strijker, D. (2003). De veenkoloniën: verleden tegenover toekomst. *Theoretische en empirische aspecten van plattelandsontwikkeling*, p 46-52
- Strijker, D. (2006). *Rural dynamics: Of hoe het platteland sneller verandert dan de stad*. Groningen: Rijksuniversiteit Groningen
- The Economist (2010). *Wheels when you need them; car-sharing*. Retrieved on 3 May, 2019 from [http://go.galegroup.com.proxy-ub.rug.nl/ps/retrieve.do?tabID=Magazines&resultListType=RESULT\\_LIST&searchResultsType=MultiTab&searchType=AdvancedSearchForm&currentPosition=1&docId=GALE%7CA236265582&docType=Article&sort=Relevance&contentSegment=ZXAM-MOD1&prodId=BIC&contentSet=GALE%7CA236265582&searchId=R1&userGroupName=groning&inPS=true](http://go.galegroup.com.proxy-ub.rug.nl/ps/retrieve.do?tabID=Magazines&resultListType=RESULT_LIST&searchResultsType=MultiTab&searchType=AdvancedSearchForm&currentPosition=1&docId=GALE%7CA236265582&docType=Article&sort=Relevance&contentSegment=ZXAM-MOD1&prodId=BIC&contentSet=GALE%7CA236265582&searchId=R1&userGroupName=groning&inPS=true)
- Urry, J. (2004). The 'System' of automobility. *Theory, Culture & Society*, 21 (4-5), p 25-39
- Voogd, J. de (2017). *Verzet in Fly-over Country*. Essay
- Woods, M. (2009). Rural Geography: blurring boundaries and making connections. *Progress in Human Geography*, 33 (6), p 849-858

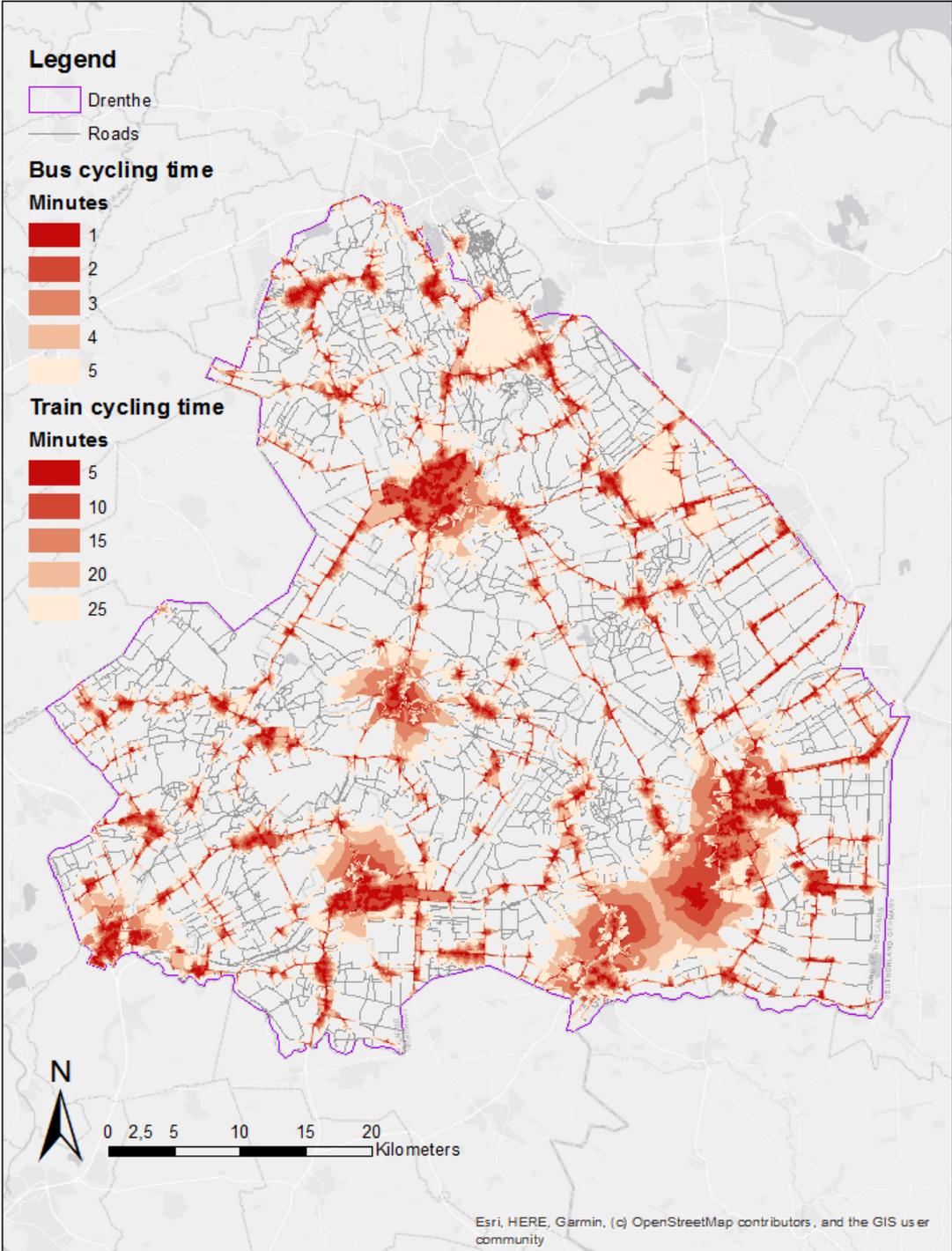
# Appendices

## Appendix 1 Walking accessibility map

### Walking accessibility to bus and train stations in Drenthe



### Cycling accessibility to bus and train stations in Drenthe



## Appendix 3 Information consent for participants

---

### **Information sheet – Research Ethics Committee (REC)**

for (doctoral) research project:

Title: Car-sharing in Drenthe

Subtitle: A GIS-based approach

Thank you very much for taking the time to consider getting involved in my (doctoral) research project.

Het hoofddoel van dit onderzoek is om erachter te komen hoe bewoners van Drenthe denken over het delen van auto's en ontwikkelingen die gelinkt zijn aan het delen van auto's. Een bereikbaarheidsanalyse uitgevoerd met behulp van GIS vormt de basis van het onderzoek. In eerste instantie wordt de bereikbaarheidskaart vergeleken met sociaaleconomische kaarten om mogelijke patronen te identificeren die invloed kunnen hebben op het reisgedrag. Daarna worden interviews afgenomen onder bewoners van Drenthe om te kijken hoe zij denken over het delen van auto's. De respondenten zijn geselecteerd op basis van leeftijd en de mate van bereikbaarheid van hun leefomgeving. Nadat de verzamelde data geanalyseerd is, zal bediscussieerd worden in hoeverre bewoners van Drenthe bereid zijn het delen van auto's te omarmen.

#### Confidentiality and participant rights

- The interviews will be audio-recorded and notes will be taken during the interview.
- You have the right to ask to have the recording turned off whenever you decide and you may also end the interview at any time.
- If you wish so you will be sent a copy of the interview notes, and you will have the opportunity to make corrections or request the erasure of any materials you do not wish to be used.
- The information you provide will be kept confidentially in a locked facility or in a password protected file on my computer up to five years upon completion of my research.
- The main use of the information you provide will help me towards my doctoral thesis (for PhD candidates), which upon completion will publicly be available on Internet.
- The data may also be used for articles, book chapters, published and unpublished work and presentations.
- Unless you have given explicit permission to do so, personal names or any other information which would serve to identify you as an informant will not be included in this research or in any future publication or reports resulting from this project.

As a participant you have the right to:

- decline to participate;
- decline to answer any particular question;
- ask for the audio-recorder to be turned off at any time;
- end the interview at any time
- withdraw from the study up until three weeks after participating in the research;
- ask any questions about the study at any time during participation; and

- ask for the erasure of any materials you do not wish to be used in any reports of this study.

Once again I thank you for taking the time to find out more about my (doctoral) research. I am at your disposal for any questions you might have. You can also contact my supervisors at the address below.

Yours sincerely,

Researcher contact details : Roy Boertien +31625270307 RBoer10@hotmail.com	Main Supervisor contact details: Farzaneh Bahrami f.bahrami@rug.nl
---	--

This research project has been approved by the Research Ethics Committee of the Faculty of Spatial Sciences. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee Ms. Alida Meerburg: email [a.meerburg@rug.nl](mailto:a.meerburg@rug.nl) Physical address:

Faculty of Spatial Sciences, University of Groningen, Landleven 1, 9747 AD Groningen, The Netherlands.

## Appendix 4 Semi-structured interview questions

### 0- Introduction

- 0.1 What is your name?
- 0.2 What is your age?
- 0.3 Where do you live?
- 0.4 Do you own a car?
- 0.5 How many cars do you have in your household?

### 1- Travel Behaviour:

- 1.1 What are your transport modes?
- 1.2 To where?
- 1.3 How often do you travel to those places?

### 2- Car dependence:

- 2.1 What do you think of the PT accessibility of these areas?
- 2.2 What kind of limitations do you encounter?
- 2.3 To what extent do you consider yourself dependent on the car?
- 2.4 Are you familiar with the idea of car-sharing?
- 2.5 Do you know or use any car-sharing service?
- 2.6 To what extent will the idea of car-sharing might affect your modes of transportation?

### 3. Costs:

- 3.1 How much time do you spend when you travel?
- 3.2 To what extent does the costs of time and money influences your travel behaviour?
- 3.3 How would car-sharing reduce, maintain or increase your costs?

### 4. Co-travellers:

- 4.1 With how many people do you travel?
- 4.2 What is your opinion about security when you travel with people you know or do not know?
- 4.3 In which way might the destination of a co-traveller affects your willingness to make use of car-sharing?

### 5. Technology:

- 5.2 To what extent are you dependent on a mobile phone or a computer?
- 5.2 How would you describe your digital skilfulness?
- 5.3 What do you think of buying tickets and choosing routes online using a mobile phone and computer?

Appendix 5 Group coding table

<b>Groups</b>	<b>Codes</b>	<b>Frequency</b>	
Personal information	Age <25	3	
	Age 25-60	3	
	Age >60	3	
	Male	5	
	Female	4	
	Car-oriented	3	
	Partially accessible	3	
	Well-accessible	3	
	Bus station well-accessible	4	
	Bus station not accessible	4	
	Train station well-accessible	7	
	Train station not accessible	1	
	Car-owner	5	
	Not a car-owner	4	
	More than one car	6	
	One car	2	
	No cars	1	
	Car-dependent	4	
	Partially-car dependent	3	
	Not car-dependent	3	
	Travel behaviour	Car user	5
		Bicycle user	8
		Train user	2
Bus user		1	
Taxi user		1	
Less than 15 minutes		5	
15 minutes till one hour		4	
More than one hour		2	
More than weekly within the residential environment		9	
More than weekly out of the residential environment		2	
Weekly out of the residential environment		1	
Monthly out the residential environment		2	
Influence of car-sharing on travel behaviour		1	
Partial influence on travel behaviour		2	
No influence of car-sharing on travel behaviour		5	
Travel costs		Time has influence on travel behaviour	4
		Time has no influence on travel behaviour	5
	Money has influence on travel behaviour	3	
	Money has no influence on travel behaviour	6	

	Car-sharing reduces travel costs	1
	Travel costs stay the same	4
	Car-sharing increases travel costs	2
Service area	Free floating	3
	One-way (station-based)	1
	Reachable distance to service area or freely parked cars	3
Environmental concerns	Influence of the environment in the choice of mobility	3
	No influence of the environment in the choice of mobility	2
Ride-sharing	Travels alone	8
	Travels with others	6
	Insecurity	2
	Feeling of security with relatives	3
	Feeling of security due to pre-obtained information	4
	Destination(s) has influence	7
	Destination has no influence	6
	Making a detour	1
	Limited knowledge of the driver	1
Digitalization	Mobile or computer dependent	4
	Not mobile or computer dependent	2
	High digital skilfulness	5
	Moderate digital skilfulness	1
	Low digital skilfulness	3
	Convenient user of online routing and planning tools	2
	Not convenient user of online routing and planning tools	6
	Manual or personal information	1
	Simplicity of online service is essential	2
Service constraints	Maintenance	1
	Economic costs of service crucial	2
	Familiar with car-sharing or similar services	4
	Not familiar with car-sharing or similar services	6
	Socialization	1
	Work	2
	Disability adjustments	1
	Uniformity of car-sharing services	1