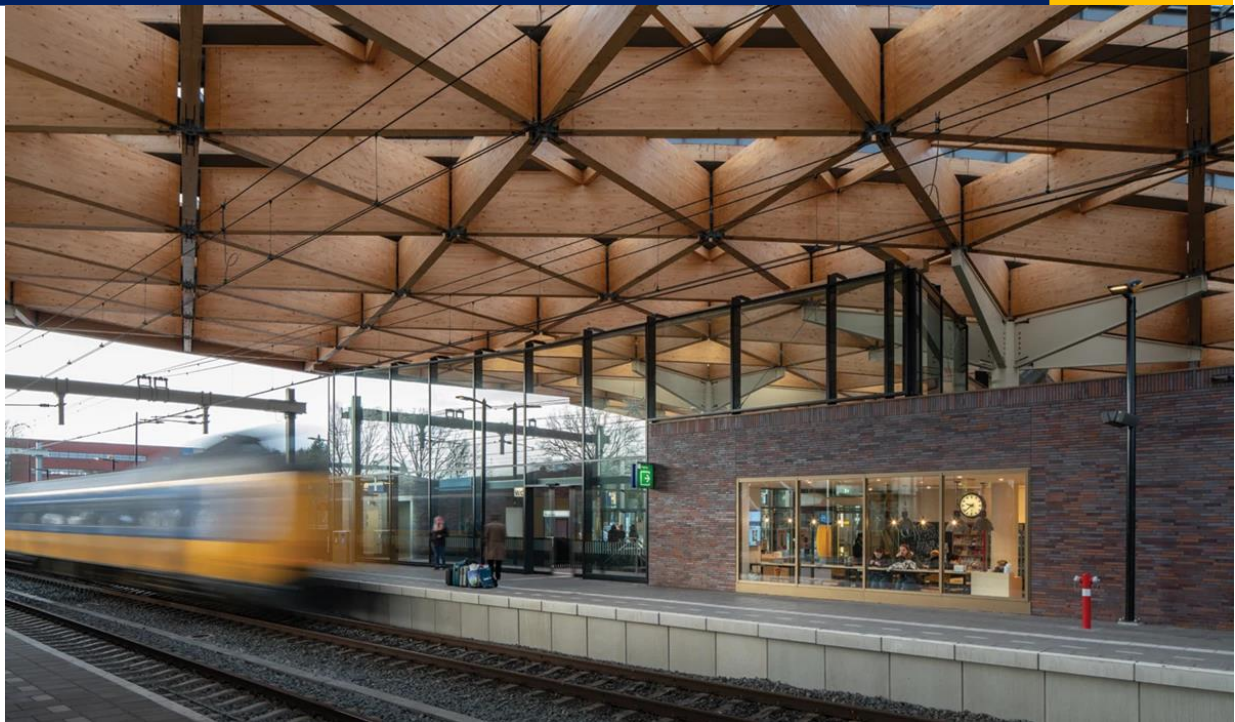


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Analysing spatial and policy interventions that contribute to more sustainable commuting in the Groningen-Assen Region.



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## Table of Contents

<b>Table of contents</b> .....	<b>1</b>
<b>Abstract</b> .....	<b>3</b>
<b>Introduction</b> .....	<b>4</b>
Background.....	4
Research problem .....	5
<b>Theoretical framework</b> .....	<b>6</b>
Mode choice .....	6
Distance to transit .....	6
Sustainable travel incentives.....	6
Car disincentives.....	7
Attitude towards mode .....	7
Conceptual model .....	8
Expectations .....	8
<b>Methodology</b> .....	<b>9</b>
Data collection.....	9
Data analysis.....	10
Combined coding tree .....	11
<b>Results and discussion</b> .....	<b>12</b>
Costs .....	12
Distance to main transit stations .....	13
Travel time.....	15
Attitudes.....	15
Bicycle.....	16
Work-related factors .....	16
Sustainable commuting suggestions .....	17
<b>Conclusions</b> .....	<b>18</b>
<b>References</b> .....	<b>19</b>
<b>Appendices</b> .....	<b>21</b>

Appendix A – interview guide Dutch.....	21
Appendix B – interview guide English .....	23

## **Abstract**

The Groningen-Assen Region has invested a lot in a sustainable travel strategy, however many travellers in the region remain to use the car, especially work commuters between the two cities. This paper focusses on these commuters aged 46-65 as they have the highest car ownership records in the Netherlands. The paper researches spatial and policy interventions that influence travel behaviour in general, by means of a literature review. This theory is tested by qualitative interviews with adult commuters living in Assen and working in Groningen. Analysis provides the following factors to be of influence in the Groningen-Assen context: costs, distance to main transit stops, travel time related factors, attitudes, bicycle features and work-related factors. Certain factors contribute to pushing commuters away from the car, like higher parking fees and others to pulling them into public transport (PT), like free PT cards and more direct transit lines between the cities. The RGA (Regio Groningen-Assen) authorities can cooperate with employers in Groningen to contribute to these pulling and pushing factors. Furthermore, it can revise the public transport grid in terms of efficiency, in order to attract more people. Future research could investigate the influence of residential neighbourhoods and the workplace on mode choice.

*Commuting, sustainable, mode choice, public transport, car use, RGA.*

## Introduction

### Background

Recent debates in spatial planning pay more attention to sustainability in general and sustainable mobility in particular. Given debates about carbon dioxides emissions, safety and air pollution especially in the urban fabric, there is a clear call to make mobility much more sustainable. That includes a stimulus for transport modes like bike, bus, train, etc. and should reduce the use of especially fossil-fuel powered cars used by an individual driver. This dilemma is even more relevant in the context of urban areas (Modarres, 2017), like for instance the urban region of Groningen-Assen. This research aims to gain better insights in which spatial and policy factors might help explain the current modal split in commuting, and how this can be improved in favour of more sustainable alternatives.

The Region Groningen-Assen (RGA) is both a geographical terminology for the area in between and surrounding the cities of Groningen and Assen in the northern Netherlands, as well as a partnership between the provinces of Groningen and Drenthe and municipalities in this area. The RGA strives to improve spatial development in the region by cooperating on the topics of economy, mobility, spatial quality and housing. Throughout these topics the involved provinces and municipalities have invested a lot to improve the accessibility of the region, as it is needed for the approximately 375.000 daily traffic movements around the city of Groningen. The RGA's three focus areas in this are: PT-hubs, high-quality public transport and the bicycle. These focus areas aim on getting people in the region to make more use of public transport (PT) and active travel modes, instead of the car. This focus aligns with the background briefly explained before. The question however is, how to make this shift more effective, as actually we can still recognize a significant use of cars, especially in commuting, in the very region RGA.

Commuting can have various different meanings (Cass & Faulconbridge, 2016), it could refer to work, sports, family time and all sorts of activities of which an individual is willing to travel a considerably large distance on a regular basis. Dependently on the mode choice, one could also debate on what large distances and regular basis are however, this research focusses on the daily work commuter (Berliant, 2024), as they have to make the same commuting trip on daily basis and thus are influenced by a constant set of factors. Data provided by the Central Statistical Office of the Netherlands (CBS, 2021), show that the largest car-owning group in the Netherlands, with 35.4% of total ownership, are people aged 46-65. For this research the influence of socio-economic factors has been limited by focusing on this specific target group. Specifically, adults aged 46-65 with car ownership in their household that commute for work daily between Assen and Groningen. Even though there are probably differences in income, it is assumed that these people make the same considerations when it comes to mode choice for commuting, as well as factors related to their age.

## Research problem

The RGA is focused on improving the accessibility of the region primarily by doing all sorts of developments that stimulate the use of PT and active travel modes. They acknowledge that car use is also part of this accessibility, however, little is mentioned about discouraging car use in favour of other travel modes. Various scholars give theoretical explanations for either stimulating PT or active travel modes or provide insights in how car-use can be discouraged. Nevertheless, it remains unclear how the authorities in the RGA can successfully implement additional spatial and/or policy interventions that make mobility in this region more sustainable, especially commuting by adults on a daily basis. An example is for instance provided by Christiansen et al. (2017) who illustrate that the availability of car-parking at home and at work affects the commuting mode choice of people and thus car-parking regulations can be seen as a tool to discourage the use of cars. The fact that the RGA has not elaborated on car-parking as a concept in its 'mobility strategy', offers the opportunity to do more research about it. Other spatial interventions include PT accessibility, transit transfers and bicycle facilities. Furthermore, policy implications can also provide useful insights, these are especially related to the total costs of travel, for instance with cheaper or free PT and discouraging the car with higher parking prices, making parking and thus car commuting almost impossible. Existing literature about sustainable commuting predominantly concentrates on either young or old age groups and oftentimes has a quantitative focus. This qualitative research provides a unique case study of the least sustainable commuting group in the Netherlands, which can broaden the academic knowledge about sustainable commuting and modal shifts.

This paper aims to discover what deterrents influence mode choice for the least sustainable commuting group in the RGA and which interventions must be made in order to make a shift in their travel behaviour possible. Doing so by answering the following question: *'What spatial and policy interventions could contribute to more sustainable commuting between Assen and Groningen for working adults?'*

This research question is subdivided in a question that explores the choice for either the private vehicle or sustainable travel modes and a question that focusses on interventions contributing to mode choice in the specific Groningen-Assen context.

- Which factors are identified in literature that help understand the choices for sustainable and car travel in general, and the choice for commuting adults in particular?
- What interventions could make a sustainable modal shift possible in the Groningen-Assen context?

## **Theoretical framework**

### **Mode choice**

In everyday travel, mode choice primarily consists of car use, PT and the active travel modes cycling and walking. In the study by Prillwitz & Barr (2011) and many other studies, a distinction is made between car use and these sustainable travel modes. Furthermore, a distinction is also made between groups that are either persistent car users or 'green travellers'. In general, cities have spread over the last 50 years, distances and travel speed have also increased, making PT, cycling and walking less attractive on the one hand and people more dependent of cars on the other (Banister, 2008). The principle related to this is that people tend to minimise their generalised costs of travel, consisting both of the actual costs of the trip and the time of travel. This makes sustainable travel modes less attractive as they are often more time-consuming than travelling by car, especially over longer distances. One of the time-consuming aspects of PT is transferring between a single or multiple transit mode. Transfers are important links in multimodal networks however, they disrupt the overall travel experience and are one of the main reasons that PT is less efficient than the door-to-door service of private vehicles (Guo & Wilson, 2011).

### **Distance to transit**

The built environment is influential in mode choice, one of the most influential factors being distance from home to transit stops and transit stops to work (De Witte et al., 2013). The proximity of residential and workplace locations to transit stations significantly affects mode choice. Individuals are more likely to choose public transit options when they are located closer to transit nodes. This is attributed to reduced travel time, lower perceived costs, and enhanced convenience associated with shorter distances to transit facilities (Cao et al., 2018). Furthermore, socio-demographic factors such as car ownership and household size also intersect with spatial proximity to transit stations in shaping mode choice preferences (Zhang et al., 2019). For instance, individuals with limited access to private vehicles are more likely to rely on public transit options, particularly when transit stations are within walking distance from their residences or workplaces.

### **Sustainable travel incentives**

As mode choice is part of individual behaviour and preferences, frequent car users prefer the comfort, flexibility and speed of their private car over PT and active travel modes. However, as other research shows there are both quality and quantity aspects of PT that could stimulate a modal shift for frequent car users. Redman et al. (2013) makes a distinction between physical and perceived PT attributes. Examples of physical attributes are price, reliability and frequency and perceived attributes consist of comfort and convenience. Following this study car users seem to be the most effected by pricing in choosing between the car and PT. On the one hand

making PT free or significantly cheaper pulls people into trains and buses and on the other hand, driving up the price for private vehicle use pushes them away from the car. Other quality and quantity attributes of PT seemed to have a less direct effect on car users, as they are considered to be basic mobility aspects that car access already provides (Redman, 2013). These attributes are related to frequency and reliability, as PT does not always ride frequently and according to schedule for individuals, whereas the private vehicle is always ready to go. However, according to Redman et al. (2013) perceived qualities like safety, crowdedness and aesthetics could attract the frequent car user on the long term, when clearly communicated by promoting and informing services.

Heinen et al. (2012) did research into incentives for bicycle commuting based on factors like built environment, bicycle infrastructure, socio-demographics, attitudes and work-related factors. This research showed that having a bicycle storage and changing rooms at work, as well as a having PT stop within 500 meters increased the number of bicycle commuters. Furthermore, active bicycle promotion on the work floor showed an increase in bicycle commuters as well. However, when the distance between work and residence increases, the number of bicycle commuters decreases (Heinen et al., 2012). The same applies for the availability of alternative mode facilities, like car parking.

### **Car disincentives**

Parking regulations that discourage car use for work could either be situated at the beginning of the trip, thus in the household situation or at the destination. Christiansen et al. (2017) have studied the probability of taking the car to work against the difficulty of finding a parking spot, parking fees and those two combined. People that have difficulties finding a parking spot do indeed take the car less than those that can find it easily, even when they are being charged. Combined, so both difficulty to find a spot and charging the parking, has the most effect on car use at work. In addition to park charging, Christiansen et al. (2017) have tested the effect of the moment of paying charges against taking the car to work. They used payment per month, per day and per hour as factors. Respectively, the probability of taking the car to work decreased in this comparison.

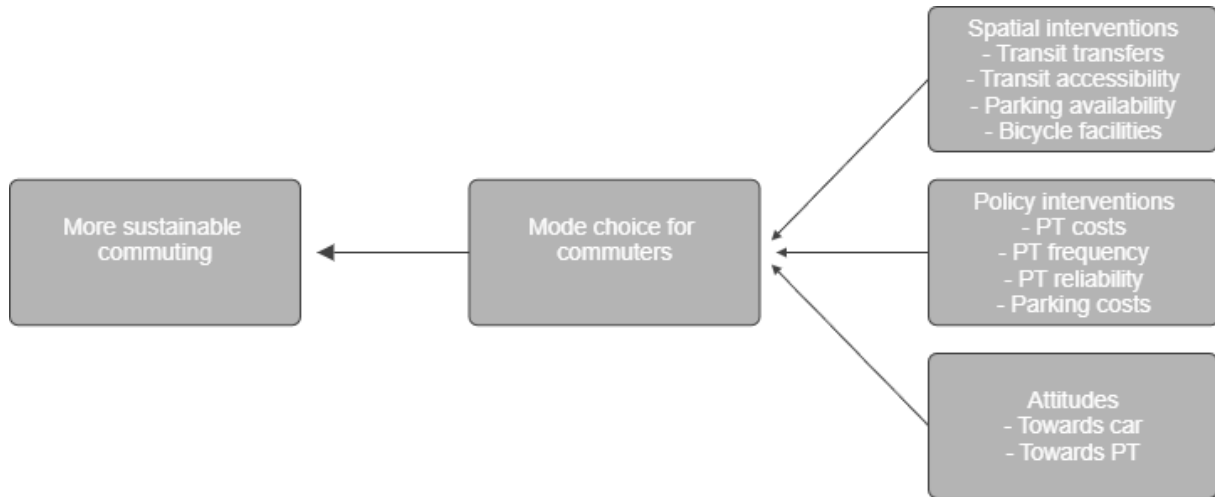
### **Attitude towards modes**

Frequent car users can see driving as much more than just a mean of transportation, they relate car driving to serious cultural and psychological values (Linda, 2003). People tend to enjoy choosing and buying a car and driving it could give them a feeling of control or superiority over others. They think driving is pleasurable, adventurous and arousing, thus they see it as more than just a utilitarian need. Simultaneously, benefits of PT are rarely seen in comparison to disadvantages of PT, like proximity to PT stations (Humpel et al., 2004), PT being on time and waiting time in general (Ringler et al., 2007), number of PT stops (Broome et al.,



2010) and uncertainty and transfers (Wardman, 1998). These side effects can create a serious disliking towards PT.

### Conceptual model



### Expectations

When asked about mode choice between the car and sustainable travel modes, literature has shown that frequent car users refer to subjective and perceived factors of travel modes. It is expected that this research will show this as well however, the structured interviews will propose objective interventions to the interviewees, which contribute to an individual modal shift in the RGA. Incentive interventions like cheaper and better accessible PT and disincentive interventions like parking costs and distance to parking. The interviews will provide which interventions can be influential to the individual interviewees.

## Methodology

### Data collection

Interviewee	Age	Gender	Neighbourhood	Workplace	Car vs. PT	Preference
1	65	Male	Assen-Zuid	City centre	-6 minutes	PT
2	46	Female	Marsdijk	Zernike Campus	-18 minutes	Car
3	53	Female	Assen-West	Zernike Campus	-30 minutes	No preference
4	64	Male	Pittelo	Helpman	-24 minutes	Car
5	53	Male	Kloosterveen	City centre	-20 minutes	PT
6	49	Male	Marsdijk	City centre	-9 minutes	PT
7	54	Male	Assen-West	City centre	-6 minutes	No preference
8	48	Male	Marsdijk	City centre	-11 minutes	PT
9	53	Female	City centre	City centre	-11 minutes	No preference
10	46	Male	Kloosterveen	Stadspark	-31 minutes	Car

TABLE 1: INTERVIEWEE INFORMATION

According to the latest data, approximately 4200 people are living in Assen and working in Groningen (OIS Groningen, 2019). There is no available data on the number of 46-65 year olds within this group. A total of 10 persons from this group (Table 1), with access to at least one car per household, have been selected for qualitative interviews of 30-35 minutes. Seven men and three women were selected. The recruitment of this selection was performed with a small snowball sampling effect, five acquaintances were selected for the first wave of interviews, after which seven referrals have been selected who matched the interview criteria. The interviews have been conducted both in person and online, dependently on the interviewees and their preference. A qualitative interview approach has been opted to acquire in-depth data about factors influencing mode choice for individuals commuting between Assen and Groningen, which should provide a foundation for advising the responsible RGA authorities.

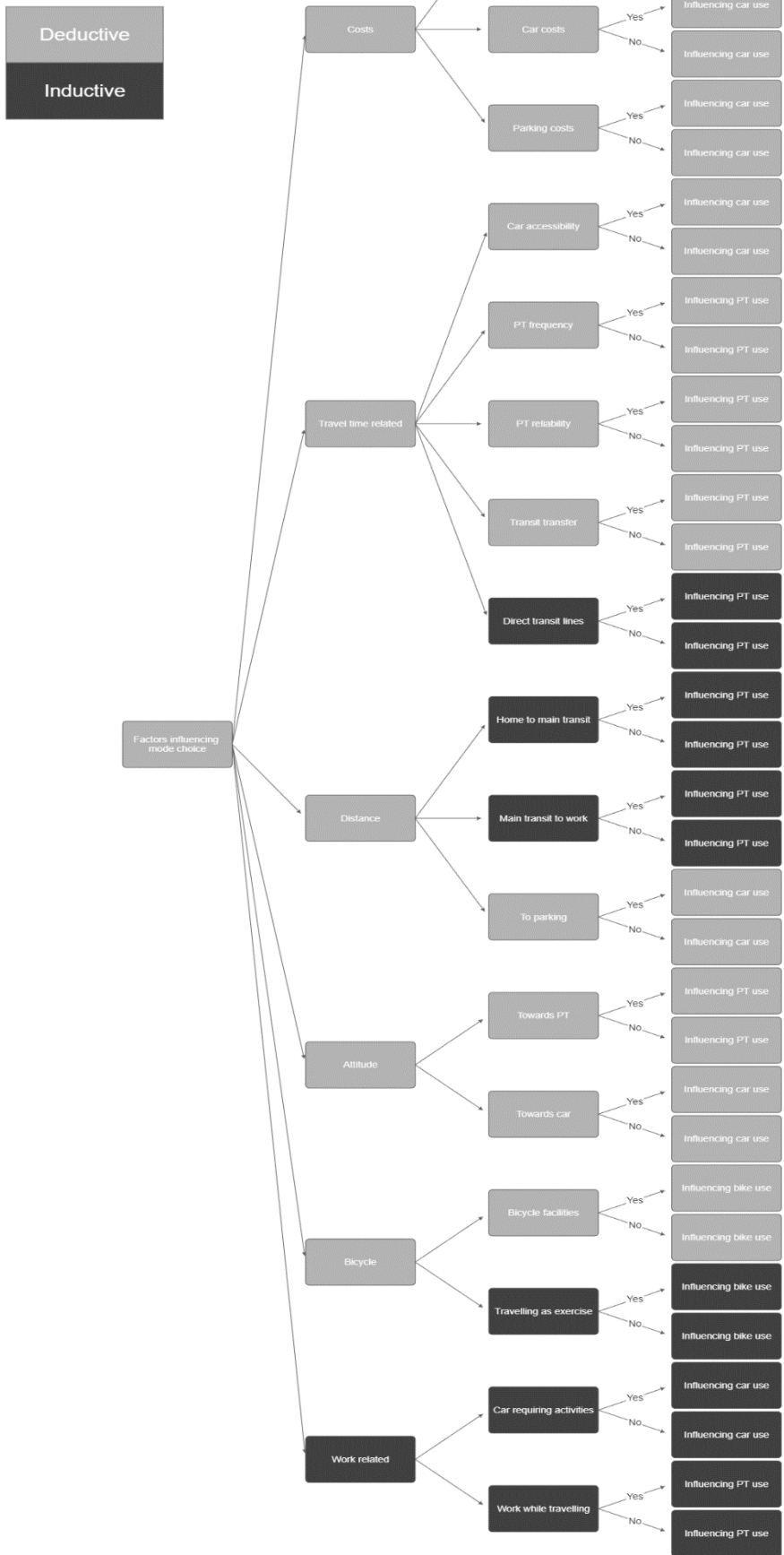
The interview guide focuses on four objective main factors that influence mode choice: costs, travel time related factors, distance to transit and parking and attitudes towards travel modes. By comparing the influence of these factors on the choice for car and PT for the interviewees, the most important factors for the Groningen-Assen context should be distinguished, which will help answering the first research sub question. Furthermore, the interview guide is structured to investigate what interventions in these factors will cause a change in mode choice for the interviewees. Certain incentives and disincentives in the Groningen-Assen context will be suggested to the interviewee, which should provide answers to the second research sub question. The final question of the interview guide asks the interviewees themselves to provide an intervention that could contribute to more sustainable commuting. These suggestions are presented in Table 3. The interview guide, included with ethical considerations can be found in Appendices A and B.

## Data analysis

The data collected out of the performed interviews has been primary analysed by using a deductive coding tree. Mode choice is dependent of couple of factors that relate to the perception of commuters in the Groningen-Assen context. These perceptions have been distinguished in the deductive coding tree and should rank several factors that are of influence. The use of a coding tree and experience with this analysis is acquired out of the Methods to Academic Research course, in the Spatial Planning and Design bachelor programme of the University of Groningen. The interviews, however, also provided factors that have not been considered by the theoretical framework and deductive coding tree. Thus, to improve the data analysis an inductive coding tree is used as well. This mixed research analysis should provide detailed answers to the research questions, both from theory and practice. The combined coding tree can be found on page 11. The codes in the coding tree are distinguished by the author, both from literature and the interviews itself. Subsequently, the interviews have manually been reviewed by the author based on this input and the phrases have been colour coded. The deductive main factors have been assigned a main colour and the connected subfactors have been assigned different shades. These subfactors have been counted throughout the interviews and the most frequent ones are presented in Table 2. For the inductive codes an alternative approach has been used. Throughout the interviews influential factors emerged that were not included in the deductive coding tree. First, these factors have been filtered out and accordingly been colour coded and connected to a main factor as described before. However, two subfactors were distinguished not connected to a main code. These have been bundled to the main code 'work related factors.' An elaboration on the distance to main station codes can be found on page 14.

In addition to the coding tree, an alternative analysis has been used. The route to the approximate home- and work location of the interviewees has been calculated to acquire a better understanding of their daily mode choice and travel behaviour, depending on travel time. This has been done by using the 9292 travel app and services provided by the national road assistance association (ANWB). Table 1 shows the difference in travel time between car and PT, showing that the car is the faster option for each interviewee. The travel time by car is calculated using the ANWB route planner app, including the mentioned time spent for parking. The travel time by PT is calculated by the 9292 PT app, including the mentioned walking/cycling from and to PT stops. In the case of no preference, the interviewee does commute both by car and PT and does not have one preferred option. A side note to this approach: the apps did not take in to account all the extra travel time due to the large road works around Groningen. This could lead to a longer travel time in practice than described in the results of this report.

# Combined coding tree



## Results & discussion

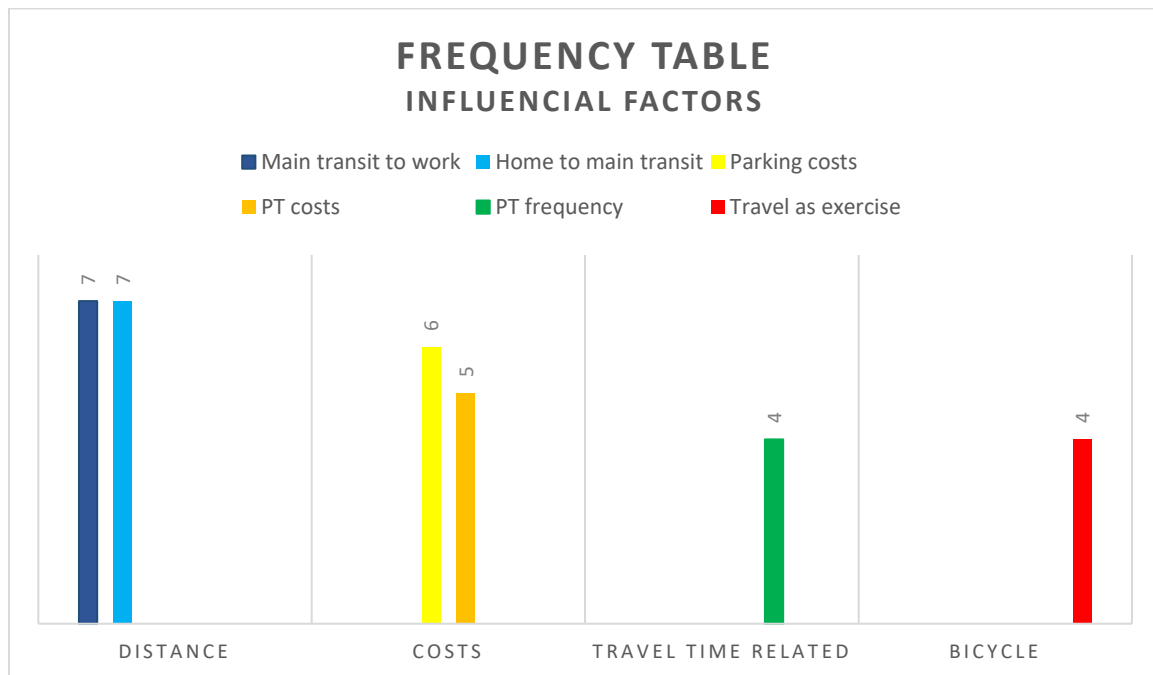


TABLE 2: FREQUENCY TABLE

Table 2 shows the most frequently mentioned influential factors throughout the 10 interviews. All the other factors are of some influence as well; however they have been mentioned far less or are influential for specific individuals. The most influential factors for the interviewees will be elaborated on in this section, as well as the influential inductive factors.

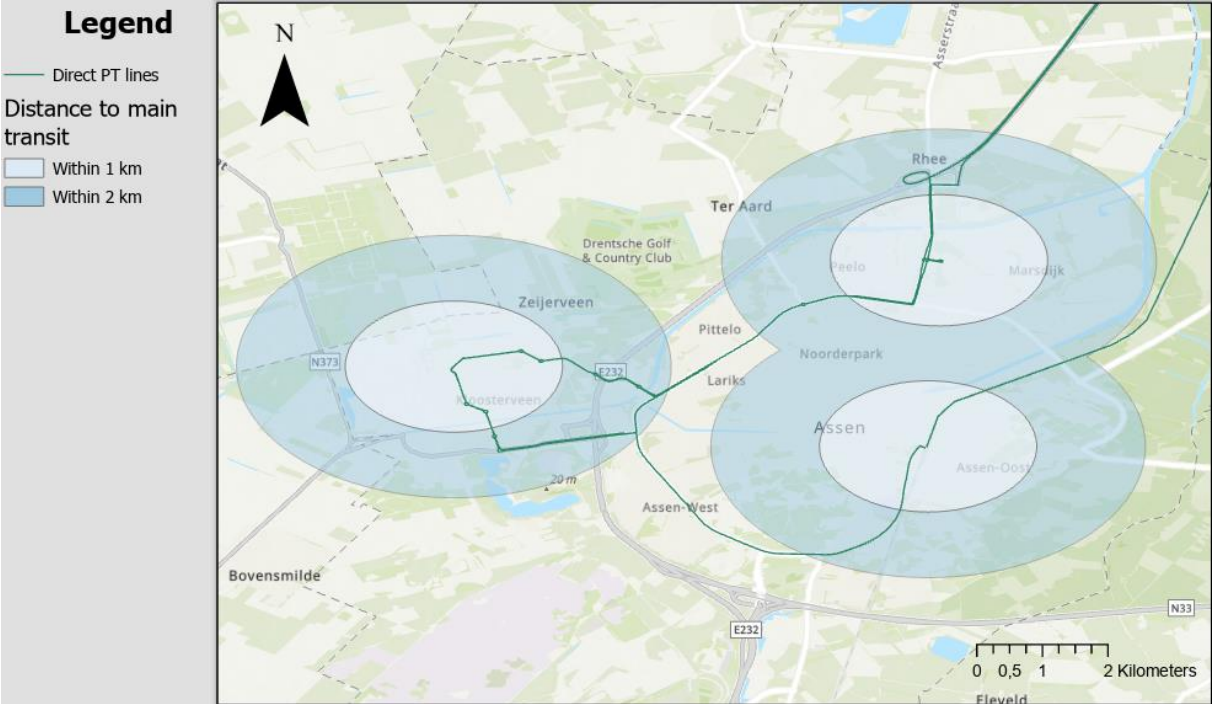
### Costs

Three types of costs are of influence for the interviewees, the costs of car commuting, the use of PT and car parking costs. The role of the employer is significant in the residual travel costs for its employees. The employer is obliged to pay a commuting allowance; however, this allowance applies to any form of transport and the amount is the same for car and PT. This allowance does not make a specific mode more attractive, though there are other means provided by an employer that can. Probably the most direct mean would be to facilitate free PT cards for its employees. On the one hand, interviewees that travel mostly by car would travel more by PT with a free card, which is in line with the study of Redman et al. (2013), and on the other hand a free PT card is one main drivers for the interviewees that frequently travel with PT.

Parking costs are an important factor in considering mode choice (Christiansen et al., 2017), especially for the interviewees who work in the city centre of Groningen, as parking tariffs are somewhat around €25 a day. For the frequent car users parking is often paid for by the employer and when asked if paid parking would influence their mode choice, every

interviewee answered yes. However, this is dependent on the price and payment periods for parking, as the results from the study of Christiansen et al. (2017) have showed as well. Interviewee 7 replied: ‘If I would have to pay the normal parking tariff, I would definitely travel more by PT, however I think my employer should pay for parking based on the requirements of my job’. Cooperating with companies to set new parking rules could thus, influence travel behaviour positively towards more sustainable modes. However, it could also backfire: ‘If paid parking would be introduced, dependent on the price, I might even consider searching for a different job’, (Interviewee 2, 2024).

**Distance to main transit stations**



**FIGURE 1:** PT MAP OF ASSEN

Figure 1 shows the three main transit stations in Assen with buffer zones of 1 and 2 kilometres, respectively meaning accessible within an approximate 5 minute bicycle or a 10 minute walking trip and accessible within an approximate 10 minute bicycle trip. These distances proved to be acceptable throughout the interviews. The direct PT lines to Groningen are depicted as well. Figure 2 shows the same spatial data for the five main stations in the city of Groningen with the direct transit lines from Assen. The two stations, Groningen Noord and UMCG, without direct transit lines are accessible by transferring to a different transport mode.

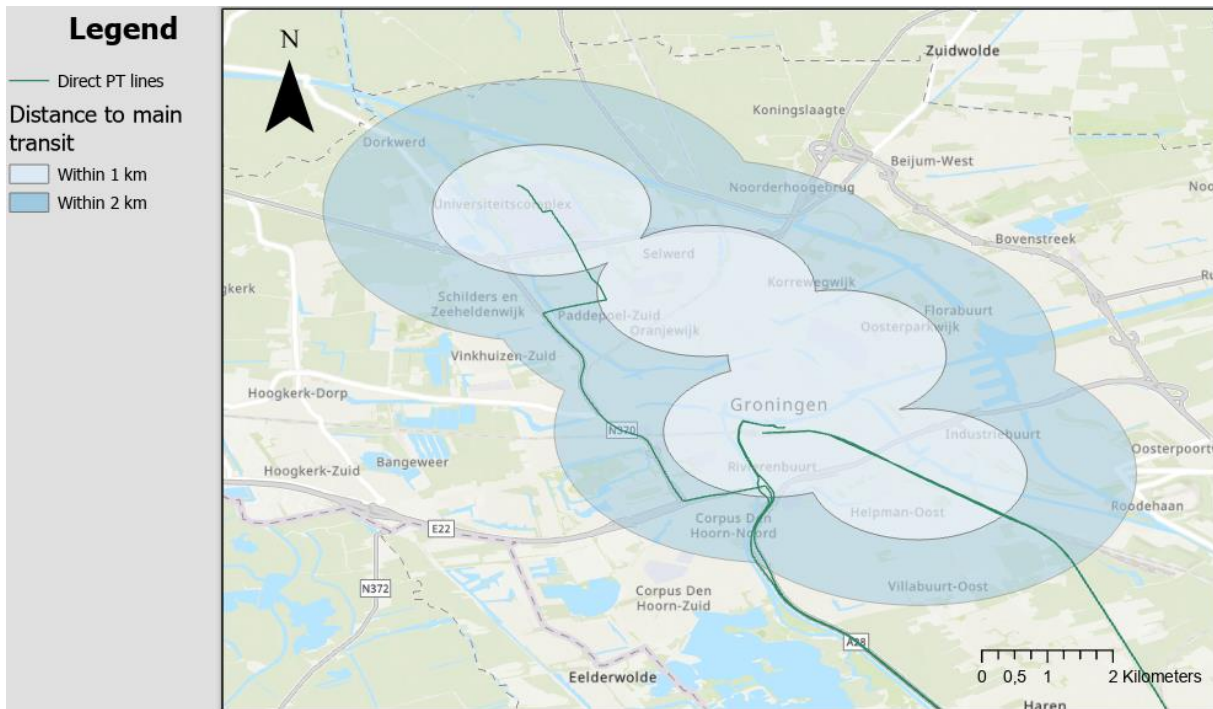


FIGURE 2: PT MAP OF GRONINGEN

Distance to transit stops is an important factor in the eventual choice for travelling with PT (de Witte et al., 2013). In the case of Assen and Groningen this is even more true for the main transit stops, as seven interviewees mention it is of influence on their mode choice. Travelling by train from Assen to Groningen main station takes approximately 20 minutes. The Assen train station is located on the east side of the city centre, which makes it accessible for people living in the city centre and in the neighbourhoods on the east side of the city. However, two of the biggest neighbourhoods are located elsewhere in the city, Kloosterveen at the west side and Marsdijk at the north side. The inhabitants of these neighbourhoods must travel at least 15 minutes by bike to reach the station, thus they have to be dependent on other PT stops and services. The Marsdijk bus station is located at the very north of the city and provides a bus trip to Groningen main station in 25 minutes. The Kloosterveen neighbourhood is connected to this station by multiple bus stops, making a trip possible to Groningen main station in 40 minutes. These three main stations cover the majority of the Assen living area, however not all of it. When the home location is further away from one of these stations, the PT trip would have to be combined with cycling and the car would then become more time efficient. 'Luckily I live close to the station, for people living in Assen-West PT would be less attractive', (Interviewee 2, 2024). Distance from home to the main stations in Assen is, thus important.

The same goes for the distance of the work location to main PT stops in Groningen, like Europapark, Groningen main station and Groningen Noord. Major bus stops could also be considered as main stop, like UMCG and Zernike Campus. When the work location is not in proximity to one of these stations, the trip must be combined with a different mode. For three

interviewees, this is the reason to commute by car. Interviewee 10 lives within 2 minutes from a bus stop in Assen, however his work location is 15 minutes by bike from Groningen main station without proper bus stops nearby. Both time and 'hassle' make PT disadvantageous in this case. The interviewees working in the city centre, thus within proximity of the Groningen main station, do not have this issue which makes PT more favourable. For both the Assen and Groningen context, proximity of home and work to transit stops are influential, which is in line with the research of de Witte et al. (2013). However, in this context distance relates to the main stations as they are connected with direct lines between Assen and Groningen. Distance to smaller transit stops are less influential in this context.

### **Travel time related**

The time actually spend in the car, bus and train between the majority of Assen and Groningen is around 30 minutes. The difference in travel time occurs, because of the combination of PT with walking or cycling. The proximity to the main stations in Assen and Groningen, as mentioned above, is decisive in this regard. The time spend on this mode transfer is, however, often accounted for. The transfer time between two PT modes is a different matter: 'The fact that during rush hours, you have to wait 2 busses makes me give up on PT', (Interviewee 2, 2024). For this and two more interviewees having to transfer modalities at the Groningen main station is the reason the car becomes more convenient than PT. The studies by Guo & Wilson (2011) and Wardman (1998) also highlight this negative aspect of PT. A positive aspect, on the other hand is frequency of PT services. Four interviewees indicate that because the frequency of transit between Assen and Groningen has increased over the last years, that the PT quality improved in the area. According to Redman et al. (2013) frequency and reliability can make PT more competitive against the car.

### **Attitudes**

Dependently on the factors described above, the interviewees can have negative or positive associations with PT. Frequency of PT services can contribute to these associations, however the bus from Assen directly to Zernike Campus does not ride frequently enough, according to Interviewees 2 and 3. This results in an indirect bus trip via Groningen main station and thus, a transit transfer. This contributes to the negative PT association. Another specific feature of PT that is mentioned in the interviews is the reliability, both for showing up in general and showing up on time as well (Ringler et al., 2007). The busses and train from Assen to Groningen main station are considered to be reliable by the interviewees, busses from the Groningen main station and P+Rs onwards are considered less reliable. This contributes to more travel time because of unaccounted transfers, which makes PT less favourable.



## **Bicycle**

As the distance between Assen and Groningen is approximately 25-30 kilometres, it is not very attractive to work commute by bicycle. Similarly to the research of Heinen et al. (2012), the number of bicycle commuters decreases as distance between residence and work increases. However, three interviewees indicate to travel by bicycle to work occasionally, because of the combination between travel and exercise. Interviewee 3 explains: 'By cycling back I can empty my head, so when I get home, I have already done my exercise and got relaxed'. Interviewee 7 indicates to intentionally travel combined by bicycle and train to get some exercise as well. These bicycle commuters indicate to have access to facilities like bicycle storage and changing rooms provided by the employer, which enables them to make this mode choice.

## **Work related factors**

The interviews also showed influential factors that have not been mentioned in the theoretical framework, which is work related factors. The nature of the job supposedly has some impact on the preferred or even required mode choice. Three interviewees indicate the necessity to commute by car for external meetings. Despite the favourable work location, these meetings are sometimes at locations that for the sake of time must be performed by car. This is an example of car dependency for work; however, it can also be the other way around. While travelling with PT, some work activities can be performed and by doing so, transforming travel time in active work time. While traveling from home to work the first preparations for the working day can be performed. While travelling from work to home unfinished tasks can be completed, taking away the necessity of working overtime at the office or working at home and therefore it offers direct private time on arrival. Interviewees 3 and 5 mentioned this to be a positive attribute of shared modality.

## Sustainable commuting suggestions

In addition to the interview guide, the interviewees have all been asked to provide suggestions that can contribute to more sustainable commuting between Assen and Groningen. The results are presented in table 3. Some are predominantly connected to the interview coding, however there are some alternative views as well, like modified transport modes.

Interviewee	Suggestion for more sustainable commuting	Explanation
1	Smoother modality transfers	For a lot of people, the problem is not with PT, but with the entire transport chain. The transfer between different modes is often perceived as not likeable. We should focus PT hubs that are accessible by bike, livelily and safe. These should improve the entire trip from door to door.
2	More busses from P+R	The P+R is currently not attractive because there is very little connection to the PT grid. If there is a good connection by bus from Assen and than onto different places in Groningen, I would definitely use it.
3	Free P+R busses	I really think P+R can be a good solution to a car-free city, but currently it is not attractive enough. At least provide enough busses and make them free.
4	Free public transport	By making PT free, a lot of costs and complicated arrangements can be reduced. If we want more people to make use of PT, we should offer simple solutions.
5	More direct transit lines	There is currently only one direct transit line from Assen that goes further than the Groningen main station, the one to Zernike Campus. To make the rest of Groningen more accessible, there should be more direct transit lines coming from Assen.
6	Better accessible train station in Assen	The train station in Assen is located in a very inconvenient way for most neighbourhoods. They should think of ways to make it better accessible, starting with better bus lines from the neighbourhoods to the station.
7	More electric cars via employer	Because of my work I sometimes have no other option than using the car. In that case employers should provide more options to drive electric, by e.g. electric lease contracts and providing equipment.
8	More efficient and direct transit lines	There are currently three direct transit lines from Assen to Groningen main station. They could be improved by connecting more neighbourhoods in Assen and connecting to other places in Groningen than just the main station. E.g. transit stops at large employers.
9	Stimulate 'foldable' bikes	Employers but also the rail companies should stimulate the use of foldable bikes. They are super convenient and provide a lot of flexibility between home, transit and work.
10	Move towards electric cars	For the people, like me, that continue to travel a lot by car, driving electric can contribute to more sustainable commuting. A requirement would than be, that employers should provide the electric chargers and such.

TABLE 3: SUSTAINABLE COMMUTING SUGGESTIONS

## Conclusions

Mode choice and travel behaviour is dependent on a large set of factors, which is different for each person and thus provides many different options and outcomes. For the case of Assen and Groningen, the most important factors are costs, distance to main transit stations, travel time related factors, attitudes, bicycle features and work-related factors. There is perspective for the region in strengthening the use of PT by pushing away from the car and pulling towards PT. Cooperation of the RGA, municipalities and the provinces with employers can stimulate this, for example by providing free PT cards on the one hand and increase the price of car parking on the other. Furthermore, sustainable commuting from Assen to Groningen is very much dependent on the three main stations and associated transit lines in Assen, which however are not all very accessible. The RGA should focus on another main station or more efficient transit line between these stations and Groningen. The frequency of the current lines has already been improved; the efficiency now has to be improved. These are the main answers to the question, how more sustainable commuting between Assen and Groningen for working adults can be realised. Furthermore, these are the interventions that the RGA authorities can implement in order to achieve more sustainable commuting for this group.

This report has not analysed the effect of gender and household composition on travel behaviour. The proportion of men was 70% in the interviews and the proportion of women 30%. The results showed no direct difference between men and women, as they travel both by car and PT based on other factors than gender. Future research, however, could investigate the difference in travel behaviour between men and women on more gender dependent factors. The composition of the research group is socio-economically determined by age between 46-65 and the ownership of at least one car per household. Future research could focus on more socio-economic factors, like income, occupation and different age groups.

The fact that distance to main transit stations in Assen is an important factor in the mode choice to Groningen, makes this research not very generalizable for the entire population of commuters living in Assen and working in Groningen. Further research into the influence of residential neighbourhoods and/or workplaces on mode choice could contribute to more generalizable results. Furthermore, the results of this research apply to 46-65 year olds and thus, the results will only be generalizable for this age group. However, this report provides the RGA authorities an in-depth analysis and policy advice about the travel behaviour of the least sustainable commuting group in the region, which could be adopted into their mobility strategy.

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## Appendix A – interview guide Dutch

*Beste meneer/mevrouw, dank voor uw deelname aan dit interview. De persoonlijke informatie die u tijdens dit interview vrijgeeft zal niet in het eindproduct van de scriptie zelf worden verwerkt, maar zal ter rectificatie worden opgeslagen in een apart document dat in handen is van de student en de universiteit. Deze informatie zal dus onder geen enkele voorwaarde met derden worden gedeeld. De verkregen informatie t.o.v. de interviewvragen zou wel in de scriptie kunnen worden verwerkt, echter zal deze informatie niet naar u terug te koppelen zijn door anonimiteit in het verslag. Het doel van deze informatie verkrijgen en verwerken in de scriptie, is om een beter inzicht te krijgen in de factoren van dagelijks reizen tussen Assen en Groningen en om conclusies te trekken over de invloed van die factoren op het reisgedrag van forenzen in dit gebied.*

1. Wat is uw naam en leeftijd?
  -
2. Hoe veel auto's heeft u als huishouden tot uw beschikking?
  -
3. Hoe ziet uw dagelijkse werkreis eruit?
  - 3.1. Met welk(e) vervoersmiddel(en)?
    -
  - 3.2. Wat is uw thuis- en werklocatie?
    -
  - 3.3. Waar parkeert u op uw werk?
    -
4. Wat is de voornaamste reden voor uw vervoerskeuze?
  - Kosten (vraag 5)
  - Tijd (vraag 7)
  - Afstand (vraag 11)
  - Persoonlijke voorkeur (vraag 14)
5. Op welke manier spelen de kosten een rol in uw voorkeur?
  - 
  - 5.1. Wat is het alternatief en wat is de rol van kosten daarin?
    -
6. Wanneer zouden de kosten van uw voorkeurskeuze u tot andere vervoerskeuzes aanzetten?
  - 
  - 6.1. Wanneer zouden de kosten van het alternatief dat doen?
    -
  - 6.2. Op welke manier kan die andere keuze gefaciliteerd worden? (push/pull)

- 
- 6.3. Wat is de rol van parkeerkosten in uw voorkeurskeuze?
- 
- 7. Wat is het verschil in reistijd tussen uw voorkeurskeuze en het alternatief?
- 
- 8. Hoe wordt dat verschil met name bepaald?
  - Overstappen (vraag 9)
  - Tijd van de rit zelf (vraag 10)
  - Afstand thuislocatie naar OV opstappunt (vraag 11)
  - Afstand OV uitstappunt naar werklocatie (vraag 12)
- 9. Op welke manier kan de overstaptijd verbeterd worden? (kwantiteit/kwaliteit)
- 
- 10. Op welke manier kan de rit sneller worden uitgevoerd?
- 
- 11. Hoe zou de afstand/reistijd van uw thuislocatie naar het OV opstappunt verbeterd kunnen worden?
- 
- 12. Hoe zou de afstand/reistijd van het OV uitstappunt naar uw werklocatie verbeterd kunnen worden?
- 
- 13. In hoeverre zou afstand tot een parkeerplek invloed hebben op uw voorkeurskeuze? (bijv. verder weg dan dichtstbijzijnde station/halte)
- 
- 14. Wat is het meest van invloed op uw voorkeurskeuze t.o.v. het alternatief?
  - 
  - 14.1 Hoe zou het alternatief zo verbeterd kunnen worden dat uw vervoerskeuze beïnvloed wordt?
  -
- 15. Wat heeft de spits voor invloed op uw vervoerskeuze?
- 
- 16. Wat zou u zelf als suggestie voordragen om duurzamer vervoer tussen Assen en Groningen te stimuleren?
-

## Appendix B – interview guide English

*Dear Sir/Madam,*

*Thank you for participating in this interview. The personal information you disclose during this interview will not be incorporated into the final product of the thesis itself but will be stored separately for rectification in a document held by the student and the university. This information will therefore not be shared with any third parties under any circumstances. The information obtained regarding the interview questions may be incorporated into the thesis; however, this information will not be traceable back to you due to anonymity in the report. The same applies to the approximate home and work location, as the results will be presented on neighbourhood scale and not on an exact address. The purpose of obtaining and processing this information in the thesis is to gain a better understanding of the factors involved in daily commuting between Assen and Groningen and to draw conclusions about the influence of these factors on commuter travel behaviour in this area.*

### Interview

1. What is your name and age?
  -
2. How many cars does your household have access to?
  -
3. What does your daily commute to work look like?
  - 3.1. Which mode(s) of transportation?
    -
  - 3.2. What are your home and work locations?
  - 3.3. Where do you park at your workplace?
4. What is the primary reason for your choice of transportation?
  - Cost (question 5)
  - Time (question 7)
  - Distance (question 11)
  - Personal preference (question 14)
5. In what way do costs play a role in your preference?
  -
- 5.1. What is the alternative, and what role do costs play in it?



6. When would the costs of your preferred choice prompt you to consider other transportation options?

- 

6.1. When would the costs of the alternative do so?

6.2. How could that alternative choice be facilitated? (push/pull)

6.3. What is the role of parking costs in your preference?

7. What is the difference in travel time between your preferred choice and the alternative?

- 

8. How is that difference primarily determined?

- Transfer (question 9)

- Time of the journey itself (question 10)

- Distance from home location to public transport pick-up point (question 11)

- Distance from public transport drop-off point to work location (question 12)

9. In what way could transfer time be improved? (quantity/quality)

- 

10. In what way could the journey be performed faster?

- 

11. How could the distance/travel time from your home location to the public transport pick-up point be improved?

- 

12. How could the distance/travel time from the public transport drop-off point to your work location be improved?

- 

13. To what extent would the distance to a parking spot influence your preference choice? (e.g., farther than the nearest station/stop)

- 

14. What is most influential in your preference choice compared to the alternative?

- 

14.1 How could the alternative be improved to influence your transportation choice?

15. What suggestions would you propose to promote sustainable commuting between Assen and Groningen?