

Navigating Sustainable Urban Mobility: Assessing the Impact of Car-Reducing Policies on Accessibility and Liveability in Groningen

A study of commuter perspectives on policy outcomes – a case study in the village of Middelstum



Figure 1: The car free Grote Markt in Groningen (Ruimte voor jou, 2023)

Bachelor thesis
Author: Rinse Kamp
Student number: S4944135
Faculty of Spatial sciences
Bachelor's project

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Abstract

This research examines the attitudes of individuals residing in Middelstum, a village near Groningen, towards car-reducing policies implemented in the city centre. Since the 1990s, growing environmental concerns have spurred efforts toward more sustainable transportation systems. In Groningen, these efforts have led to policies aimed at decreasing car usage, with the ultimate aim of establishing a zero-emission zone in the city centre in 2025. The ban of fossil-based vehicles in this area has raised questions about the implications of such policies for individuals reliant on cars as their primary mode of transportation. Utilizing qualitative research methods, through semi-structured interviews and document analysis, this study seeks to explore the perspectives of residents in Middelstum, as well as the political drivers behind these car-reducing measures in Groningen's city centre. This research finds out that the positive effects car reducing policies (CRP) have on the human environment outweigh the negative impact on the accessibility of the place for people living in Middelstum. However, there is a minority of individuals with mobility issues for whom CRP has more negative effects, thus reducing their perceived place attractiveness of the city centre of Groningen. To ensure more political feasibility and ensure a more effective implementation of CRP a few implications have to be included in the implementation of CRP, including diverse hospitality, shopping, and cultural amenities within the city, accessible and cost-effective park-and-ride (P+R) and public transportation (PT) options, enhanced regulations for bicycle usage and parking, designated loading and unloading areas, alternative means of reaching the city centre for those with limited mobility, and improved provincial connections from Middelstum to the city centre via better bus and bicycle routes.

1. Introduction

In the aftermath of World War II, European urban planning and urban transport predominantly prioritized private cars (Rye and Hrelja, 2020), resulting in increased car accessibility and space for car parking in cities, especially in city centres. This focus on cars was driven by their convenience and popularity as a mode of transport.

However, in the 90s this perspective of car-oriented cities began to change, stimulated by the commitment of the European Union (EU) to reduce greenhouse gases by 20% (compared to 1990 levels) (Fontaras and Dilara, 2012) and EU policy goals to make urban transport fossil-free in 2030 (Rye and Hrelja, 2020). These environmental concerns were compounded by trends in urban population growth, which have four key drivers according to Duranton and Puga (2014): transportation and housing supply, amenities, agglomeration effects (especially related to human capital and entrepreneurship), and technological advancements.

In response to global environmental concerns and trends in the growth of cities, the Netherlands implemented a national policy in which many locations in city centres will be zero-emission zones in 2025. This means that fossil-based vehicles are not allowed in these zones, except with a special permit, (e.g. security companies, city surveillance vehicles, market stalls) from January 1, 2025 (Ondernemersplein, n.d.). The city of Groningen is also implementing this policy from April 1, 2025. (figure 2, Gemeente Groningen, n.d.)

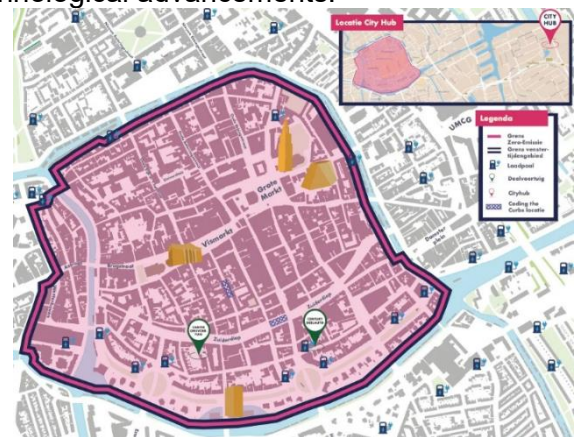


Figure 2: The zero emission zone in Groningen from April 1, 2025 (Gemeente Groningen, n.d.)

Car reducing policies have a longer history in Groningen. In 1977, the first policy to reduce cars in the city centre of Groningen and create more room for the other functions of the city was introduced by aldermen Jaques Wallage and Max van der Berg in the traffic circulation plan (Zuid, n.d.). This plan included reduction of parking space at the Vismarkt and traffic reduction at the large roundabout at the Grote Markt. At that time this plan led to a lot of opposition by citizens. Later, in 1996 the removal of cars from city park Noorderplantsoen, which until then was crossed by a car road, had more citizen support. The policy was implemented after a referendum among citizens, where 51% of the citizens voted to remove cars from Noorderplantsoen (OOG tv, 2019). Since July 17, 2022 there is no bus connection with the Grote Markt anymore and the plan is to decrease, and ultimately ban, busses in the city centre altogether (Groningen Bereikbaar, 2022).

These car-reducing policies (CRP) in the city centre of Groningen have positive impacts on the city's liveability. The reduction of cars will mitigate pollution, congestion, noise, emissions, and land use (Loukopoulos et al., 2005). Moreover, there is an expected population growth in the municipality of Groningen of 13% between now and 2030.

Commuting by car is the most space-consuming mode of travel, especially on major roads like the ring road where vehicles travel at higher speeds (Figure 3). With the current travel behaviour of people this would require 13% more space in the city, while space is already limited. Because of this the municipality aims to change people's travel behaviour from car oriented to public transport (PT) and cycling (Gemeente Groningen, 2019). For individuals relying on PT to commute to the city centre of Groningen, it still entails a 15-minute walk from the Groningen central station to the Grote Markt.

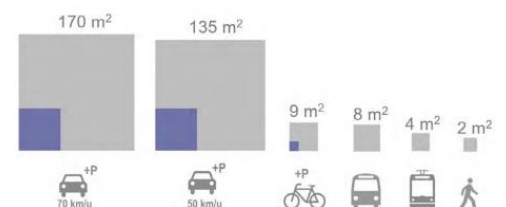


Figure 3: Land use per mode of transport (Gemeente Groningen, 2019)

There's a concerning trend of decreasing bus stops in the province of Groningen. This decline is attributed to the lack of profitability for privatized bus companies, particularly with smaller stops (RTV Noord, 2023). This might mean that the CRP in the city of Groningen has significantly more negative impacts on the accessibility of those residing in the province, where PT options are less available. The city of Groningen is a central hub within the province in terms of jobs and services, such as education, healthcare, leisure, etc. These jobs and services will become less accessible for those traveling by car, as a result of CRP.

Research problem

According to Lee (2015) there is a positive correlation between place attractiveness and the external accessibility of the place. Mayo and Jarvis (1981) define place attractiveness as "The perceived ability of a destination to deliver individual benefits". External accessibility is divided into three categories: accessibility by private vehicles, PT services and connection to nearby attractions. Similarly, Prideaux (2000) illustrates the importance of transportation in destination development, highlighting the positive correlation between destination attractiveness and transportation options. Considering this positive correlation between place attractiveness and external accessibility, CRP are likely to have a negative impact on the perceived place attractiveness for individuals who depend on their car to travel to the city, especially those residing in areas with limited PT connections. Figure 4 shows the area that is within a 45-minute public transport travel time to the Grote Markt. Beyond this area, the negative impacts of CRP in Groningen become more significant. So, were for people who reside within a biking distance or with good PT connections to the city centre the benefits of CRP are likely to outweigh the drawbacks, this can be the opposite for those depending on their car as a mode of transportation.

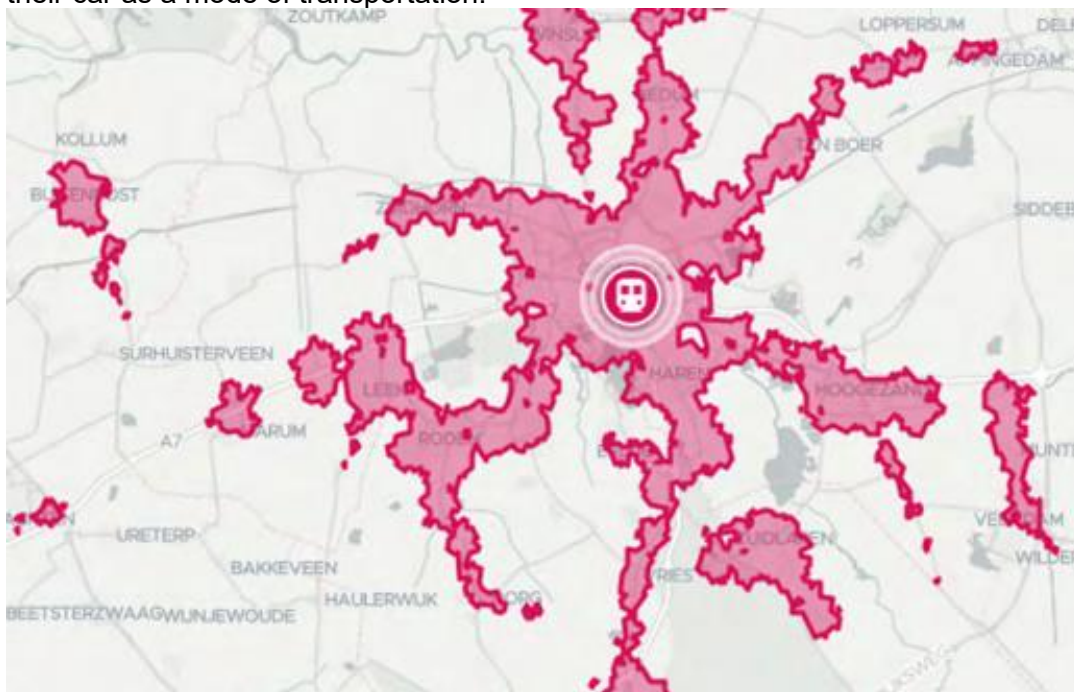


Figure 4: 45 minute travel time from the city of Groningen. (Gemeente Groningen, 2019)

Middelstum, a village in the municipality of Eemsdelta with approximately 2,200 residents, exemplifies a place with relatively limited PT connectivity compared to car connectivity. Located 19 kilometres from Groningen, the village, despite its close geographical proximity, requires over 50 minutes of travel time by PT due to the inefficiency of the bus route and the number of bus stops along the way. A comparative analysis between Figure 4 and Figure 5 reveals that while the area northeast of Groningen (including Middelstum) extends beyond the 45-minute PT threshold (Gemeente Groningen, 2019), it remains within a 20-minute travel radius by car. This disparity can create social inequalities within the province of Groningen.

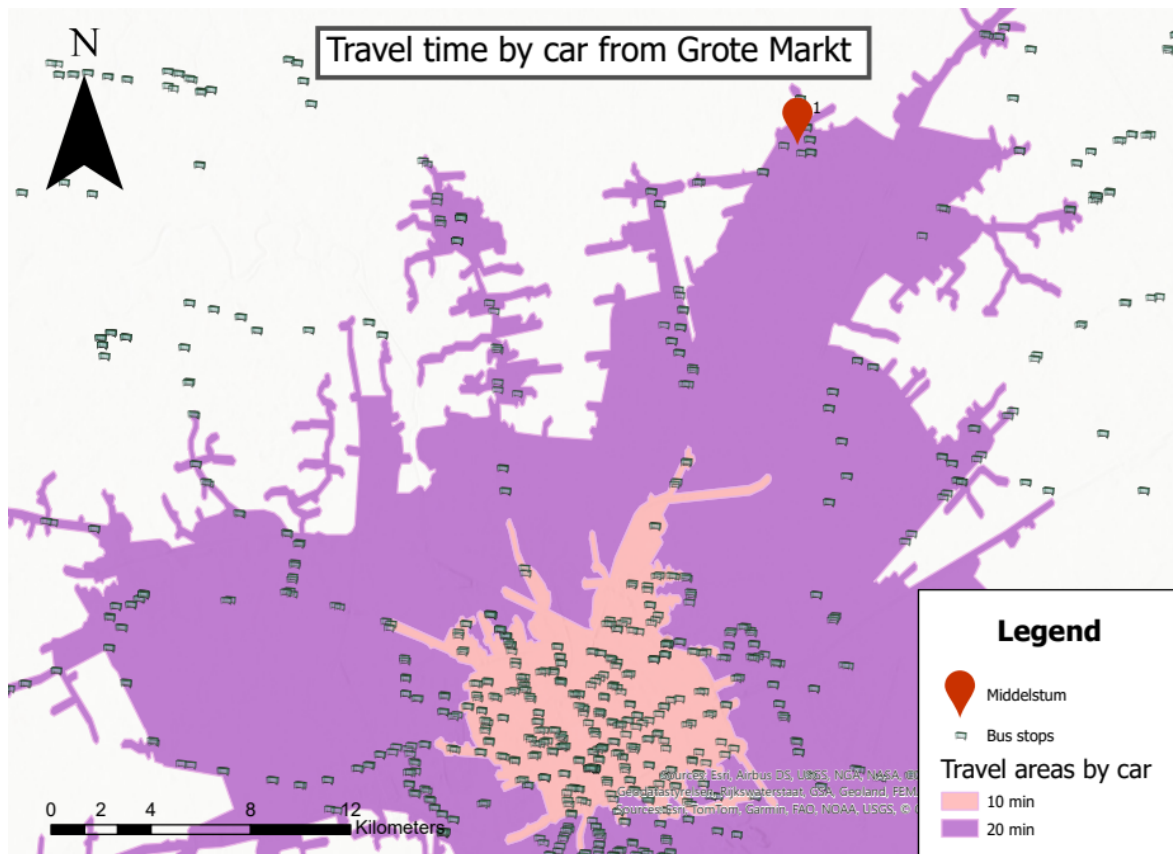


Figure 5: Travel time areas by car measured from Grote Markt

Research aim

The aim of the thesis is to investigate the potential impact of CRP on the attractiveness of Groningen as a destination, considering the correlation between destination attractiveness and external accessibility, which encompasses private vehicle accessibility, public transport services, and connections to nearby attractions. The thesis seeks to understand how the pros and cons of CRP are perceived by individuals traveling to Groningen, living in places in the province with poor PT connections to the city.

The central question of the thesis is: What are the impacts of CRP in Groningen on the perceived place attractiveness of Groningen as a destination by those residing in areas with limited PT connectivity and commuting to Groningen?

The central question is divided into the following sub-questions:

- What factors impact travel behaviours to Groningen of people residing in areas with limited PT connectivity?
- To what extent do individuals believe that the benefits of CRP outweigh any perceived limitations or inconveniences in accessing Groningen by car?
- How can policymakers in Groningen address anticipated challenges for car commuters under CRP, ensuring effective policy outcomes?

2. Theoretical framework

Accessibility is defined and used in many different ways by different authors. Geurs and van Wee (2004) define accessibility as: "The extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)" (p. 129). This definition has four components that are important to measure accessibility:

- The *land use component* consists of the amount, quality and spatial distribution of opportunities (e.g. jobs, shops, health, recreational and social activities etc.) supplied at a certain location, the demand for these opportunities and the confrontation of supply and demand for these opportunities.
- The *transportation component* is defined as the disutility for an individual to cover distance between origin and destination using a specific mode of transport. This includes amount of time, costs and efforts.
- The *temporal component* reflects the availability of opportunities at different times a day.
- The *individual component* is defined as individual's needs (age, income, educational level, etc.), abilities (physical condition, availability of travel modes, etc.) and opportunities (depending on people's income, budget, etc.)

Lee (2014) makes a distinction between internal and external access to places. Internal access refers to place-specific characteristics that influence accessibility, such as opening hours, entry fees, parking lot, etc. For this thesis, we focus primarily on the external access to places, which, according to Lee (2014), refer to the pathways (groups of) individuals have to traverse to reach a certain place. This can be divided into accessibility by private vehicles, accessibility by public transport and connection to nearby attractions.

According to Loukopoulos et al. (2005), the increasing trend of car ownership is a threat to human environments on several levels. Economically, many researchers nowadays question the assumption of a positive relationship between economic and transport growth because of inefficiencies in current production and transportation trends. Socially, increasing dependence on automobiles creates social inequalities because it runs the risk of exclusion for some sizeable minorities (e.g. the elderly, the handicapped, the unemployed, etc.). The most obvious effects of automobilization are environmental, including, congestion, noise, pollution, emissions and land consumption. It is generally assumed that political feasibility is influenced by public attitudes towards policy measures. Attitude, in this context, reflects how people feel about a specific thing, whether positively, negatively, or neutrally, also known as the attitude object (Loukopoulos et al., 2005).

The Theory of Planned Behaviour (TPB, Figure 6) by Ajzen (1991) state that people's behaviour is influenced by the intention towards that certain behaviour. Applied to transportation choices, this TPB suggests that people's travel behaviours are shaped by their intentions regarding specific modes of transport. For instance, a resident of Middelstum who prioritizes short travel time is likely to choose a car over public transportation or a bicycle. The Theory of Planned Behaviour posits that individuals' behavioural intentions are shaped by their attitudes toward that certain behaviour, including negative, positive, or neutral perceptions. Additionally, subjective norms and perceived behavioural control further influence individuals' intentions toward a certain behaviour. This research tries to find a link between people's attitudes towards CRP and their travel intentions and actual -behaviour.

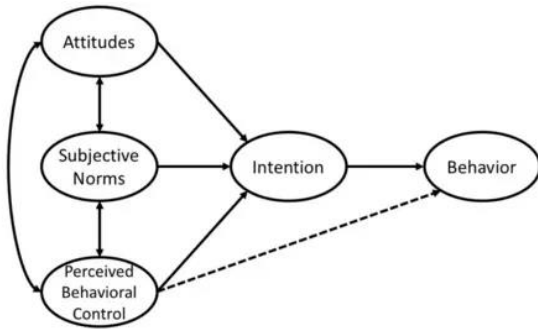


Figure 6: The theory of planned behaviour (Ajzen, 1991)

This thesis investigates the impact of reduced accessibility to the city centre of Groningen by car for residents of Middelstum on their attitudes toward CRP and their perceived place attractiveness. Additionally, it examines how these attitudes toward CRP and perceived place attractiveness influence individuals intentions regarding specific travel behaviours and, consequently, how these intentions indirectly shape their actual travel behaviours. The conceptual model of the thesis is shown in figure 7. In this thesis the following hypothesis will be tested: *"The enactment of CRP in Groningen, resulting in diminished car accessibility to the city centre, is proposed to affect individuals' perceived place attractiveness and intentions regarding travel modalities, consequently influencing their actual travel behaviours indirectly."*

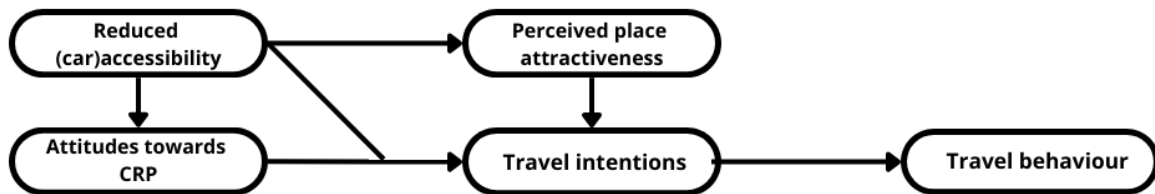


Figure 7: Conceptual model of the thesis.

3. Methodology

Qualitative research methods, in the form of semi-structured interviews were conducted to test the influence of CRP in Groningen on the attractiveness of the city. This methodology was employed to ensure thorough research outcomes regarding perceived place attractiveness and the capacity to pose follow-up inquiries. Additionally, attitudes, subjective norms, and perceived behavioural control are variables that depend on both context and personality. This qualitative research method allowed for open response in the participants' own words rather than a 'yes' or 'no' answer (Clifford et al., 2010).

The research pool consisted of six interviewees. Five of them were selected based on their commuting distance and time to the city, as they all reside in or near the village of Middelstum. In addition, an interview was conducted with a policymaker in the city of Groningen. The primary purpose of this interview was to understand the drivers behind the CRP and to assess how the plans have been implemented and how they are perceived by residents from Middelstum.

The interviewees were approached via telephone, e-mail, or through a direct approach where the researcher went into the field and asked people in person. The researcher conducted fieldwork in the village of Middelstum, where he engaged in observational walks and approached residents to inquire about their willingness to participate. The researcher explained the general format of the research and asked for their interest in participating, providing them with a flyer containing contact details (appendix 5). After finishing the interviews, the researcher asked the interviewees if they knew other people who lived in Middelstum and were willing to participate in an interview.

During the selection of interviewees, efforts were made to ensure that the researcher, to a certain extent, did not have a personal connection with the interviewees (e.g. no direct friends or family), contributing to more objective results. The interviews were conducted at the place where the interviewees felt most comfortable, whether this was at their home, through zoom, at their office or at an external place (e.g. internet café, library, etc.). The interviews were conducted and transcribed in the language the interviewee is most comfortable (Dutch or English) with, therefore all interview guides are in Dutch as well as in English. After execution of the interviews, the results were transcribed and analysed through coding using ATLAS.ti. The codes were generated in a deductive manner, based on the concepts of TPB, external accessibility and human environment, which influence place attractiveness in the city of Groningen. This led to the development a deductive coding tree, as shown in figure 8.

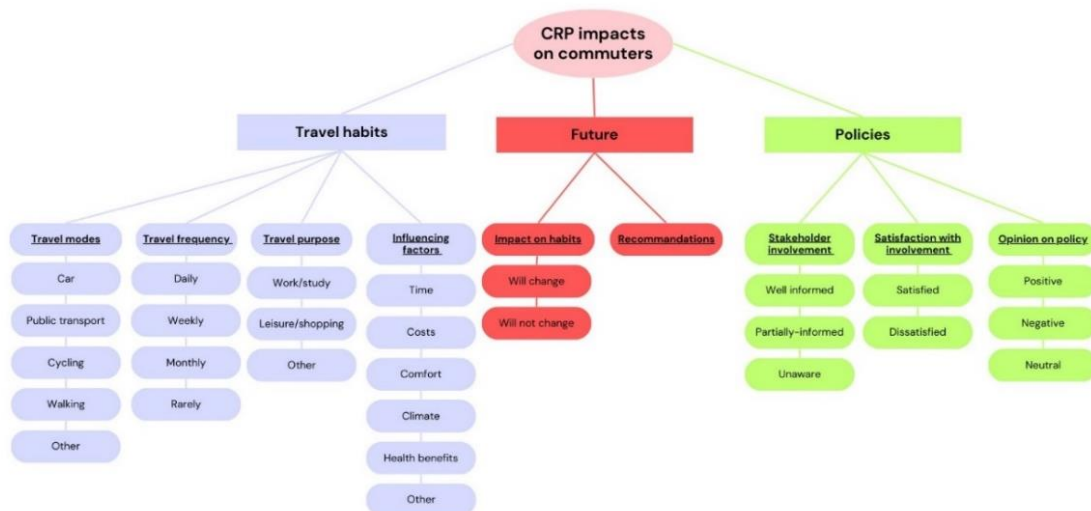


Figure 8: Coding scheme

During the process of analysing the results of the interviews, some answers provided new insights into the commuter perceptions about CRP. These overlooked factors have led to the addition of inductive codes to the coding tree, generating an inductive coding tree, shown in figure 9. All the codes with a black outline were the additional inductive codes.

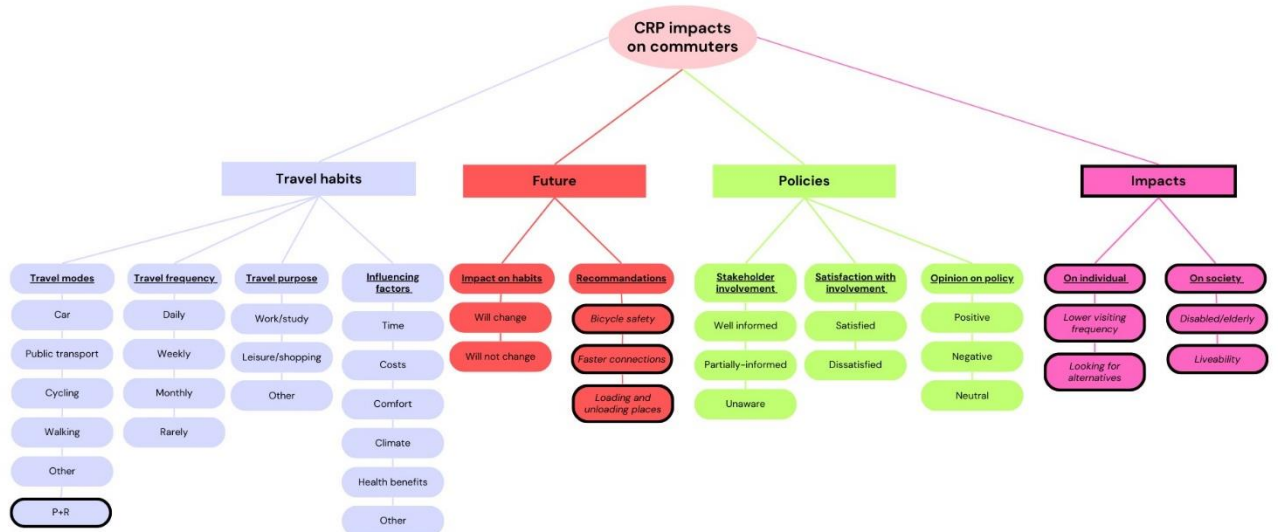


Figure 9: Coding scheme including inductive codes

The outcomes of this research may inform policy makers about CRP plans in Groningen. This provides recommendations, which can be taken into account into future policy decisions with regards to CRP in the city of Groningen and/or CRP elsewhere.

Data management

The full interview guides are in appendix 2- & 3A (Dutch) and 2- & 3B (English). In this qualitative research, interviews were conducted in a one-on-one setting. For the results of this research, honesty and integrity of the interviewees' responses were valued. Therefore, in appendix 4A (Dutch) and 4B (English) detailed consent forms were included. This was the bases of which the researcher of this thesis ensured confidentiality and privacy of the informed interviewees' answers. In addition, beneficence was a central concept which was taken into account, as in no way would interviewees be harmed for the benefits of this research. Interview data were stored safely, withdrawal of the interviewees was possible at any time, and the interviewees received summaries of the interviews. Interviewees were actively reminded about their rights.

4. Results

Drivers of CRP in Groningen

From the first traffic circulation plans until the CRP as we know it today the primary objective has been to allocate more space for the various functions of the city centre. The goal is not to completely prohibit car access to the city centre, but to minimize the amount of space cars occupy, primarily by reducing on-street parking. As confirmed by this quote of a policymaker: *"It's not that we say: 'The car is not welcome anymore'. But you see a trend that public parking in the inner city is reduced and that space is used for other functions."*

The municipality also questions the fairness of allowing some individuals to park their cars in the limited public space of the city centre. While others, who do not own cars, do not benefit from this allocation of space. Although this incurs financial costs, these are relatively low compared to the amount of space that parking occupies.

Travel behaviours

Most participants reported traveling to Groningen for leisure activities, such as dining out, shopping, visiting friends or family, or attending cultural events. Participants engaged with these activities have travel frequencies ranging from once a month to a few times a year. Additionally, certain participants reported higher frequencies of travel, which were typically influenced by the nature of their trips. For example, participant 4 visited Groningen multiple times a week due to work obligations, while participant 5 travels to Groningen multiple times a week for a combination of reasons, including attending their children's sporting events and school, visiting family, seeking medical care, shopping, and dining out.

It's evident that travel frequency is linked to the purpose of trips undertaken by individuals.

All participants cited the automobile as their predominant mode of transport for trips to Groningen. The most important factor in this decision is travel time efficiency. While some participants opt for personal vehicular transport, as shown by this quote of participant 2: *"I always use my own car. I'm not aware of the current bus lines and times but I once looked it up and saw that it takes so much more time, and I don't like cycling."* Others adopt a more varied travel approach, but all of the participants often use their car. For instance, participant 3's decision between car and bus depend on the number of destinations planned: *"It depends on the destination, if we go to one specific location we take the bus but if we visit multiple destinations we prefer the car."* Both participants one and five underscored how their specific travel purpose impacts the selection between bus or car. Notably, they opt for the bus when attending events where alcoholic consumption anticipated but prefer the car for non-alcoholic events.

The use of the bicycle as mode of transport for trips to Groningen varies among the participants. Participant 4, if weather conditions are good, expresses a preference for cycling because of health reasons. Weather conditions emerge as a significant determinant for participant 5. She highlighted that her children commute on a daily basis to school in Groningen by bike, and that they only resort to the bus during inclement weather. Several participants cite reasons to avoid the use of their bicycle as mode of transportation, such as personal aversion to cycling or concerns regarding bike security and maintenance. One participant remarked: *"I don't like cycling"*, while another stated: *"My bicycle is expensive and I don't like to stall it in the city because could get stolen or could break down in the bike stalls because of how people treat bicycles."*

Awareness and responses to CRP

None of the participants were directly informed about the CRP in Groningen through formal channels such as letters or emails. Rather, most participants acquired background knowledge from media sources or personal experiences with CRP in Groningen. For instance, participant 3 explained his firsthand experience, stating: *"When we visited a show*

on The Grote Markt a time ago, we found out that the bus does not stop there anymore. This was a bit annoying and it would have helped if we knew this beforehand."

Many participants have a passive stance regarding their involvement in the CRP process, or they understand their indirect role in the policy's implementation. As stated by participant 2: *"I can imagine that we are not informed since we don't live in the city but in another municipality."* However, certain participants expressed their concerns about their lack of awareness despite demographically most affected by CRP in Groningen. As articulated by participant 5: *"We are the people that need the car to reach the city, while for people that live there it's much easier to take the bike or the bus. So in that sense, I would have liked to receive more information."*

There are mixed reactions to controversial decisions, such as removing buses from the Grote Markt. However, as confirmed by the policymaker, those who oppose the plans are more vocal compared to those who support them. Often, it is also a matter of people needing time to adjust to certain plans, and over time, their negative opinions can shift to positive ones. As confirmed by this quote of the policymaker: *"People appear to be more likely to express their negative opinions. But it usually turns out that they have to get used to the idea and then quite like it."*

During the semi structured interviews with residents of Middelstum, participants were queried about their perceptions on CRP, including whether they believed the benefits outweighed the drawbacks. All the participant see the benefits that CRP have in terms of liveability, safety and mitigating noise and air pollution. They all expressed that walking the last part of their journey to the city centre is no problem for them because they describe themselves as healthy persons. Nevertheless, certain participants expressed their concerns about elderly and people with other mobility limitations, particularly in relation to the physical burden of carrying heavy loads. For instance, participant 1 articulated: *"I can imagine that it's nice if its calm in the city centre. But it has downsides for people who are old or bought something heavy. There should be a solutions for those people because no one likes to walk carrying heavy stuff."*

According to several participants, there is an expected change in type of businesses operating in the city centre. With stores specializing in heavy merchandise potentially relocating from the city centre to make room for an increased presence of bars, restaurants and smaller retailers. Participant 4 suggested that CRP may influence people's shopping behaviours, especially if challenges arise in finding convenient parking for heavy purchases. She noted: *"What if you want to buy something heavy but you can't park your car nearby? I think people are more inclined to buy digitally."* Participant 5 also mentioned the fact almost all the cars in the city centre at the moment are already local traffic.

P+R

A practical solution to avoid parking issues in the city centre is by using a system called park and ride (P+R). The municipality aims to encourage people, particularly occasional visitors to Groningen, to use the P+R facilities. Compared to other cities in the Netherlands, Groningen has a well-developed P+R system. This is articulated by this quote of the policymaker: *"So if you are a visitor, we want you to use our P+R system. We have five P+Rs in Groningen, which are used a lot. Many cities are jealous that we invested in P+Rs on time, and that is really good."*

For certain participants, P+R, which means parking their car at 'Kardinge P+R' and continue their journey by bus, is a viable alternative for reaching the city centre. Nevertheless, concerns have been raised regarding the P+R system. Participants one and four have highlighted the perceived high cost of bus tickets relative the fact of walking the final segment of the journey. Participant 1 remarked: *"In the past you could use these busses for a few*

euro's with your entire family, but these tickets became very expensive nowadays."

Therefore, for the majority of participants, the P+R system would represent a feasible response to CRP, if it remains affordable and offers convenient transportation to the city centre via bus or non-motorized alternatives. However, participant 5 contends that P+R may not be a viable option for her, expressing a preference for accepting higher parking fees in the parking garages surrounding the city centre. She said: *"I'm not a type of person for a P+R. I prefer to park my car as close as possible to my destination and accept the higher parking fees. I can afford this, but I can imagine that this is an issue for others."*

Impacts of CRP on travel intentions

Participants were queried about the anticipated effects of CRP in the city centre of Groningen on their travel intentions toward Groningen. According to participants, CRP do not directly influence the frequency of their trips to the Groningen city centre. This is primarily because they don't visit the city centre that often, and because of the purposive nature of their trips. Additionally, the absence of an alternative city, offering similar amenities, in proximity to Middelstum further strengthening this stance for most participants. The purposive nature of the trips is underscored by participant 1's statement: *"Car-free or not, for me it's more important that everything around is well organised. That there is a versatile offering for young and old. That you come home after a visit in the city with a feeling like: "Hey, I was actually in town for a while"."* This supports the municipality's stated objective behind the CRP: "To reduce the space occupied by parked cars, thereby creating more room for other functions and enhancing the overall quality of urban space usage."

Conversely, participant 5 acknowledges that CRP may not affect her travel behaviour directly, but she recognizes its potential impact on individuals with mobility limitations.

Other factors influencing travel intentions

As indicated in the preceding paragraph, CRP are not anticipated to directly alter the travel intentions of the participants. Nonetheless, other factors contribute to the perceived attractiveness of the Groningen city centre among participants. One such factor, emphasized by participant 1, pertains to the need for increased regulations on bicycle usage in the city centre. The amount of improperly parked bicycles contributes to a sense of insecurity, as articulated by this quote of the participant: *"Cars are already stopped, but cyclists are not stopped. I also think it gives off a bit of an unsafe atmosphere, especially when you come through the city early in the morning, with all those bicycles lying on the ground. How many bicycles there are on the ground and on the street. If that just becomes better organised and you have good places where you can safely park your bicycle. Than people will go by bike. That's why I don't go by bike now, for example. I find the road to and the city centre itself a mess in that area."* The policymaker acknowledges some pedestrian and cyclist chaos in the city centre, but notes that: *"Compared to other cities, we cannot complain as they are still struggling with massive automobile or bus congestion. In that sense, it's a luxury problem."*

If buses are no longer permitted, alternative measures should be implemented to ensure physical accessibility for individuals with mobility limitations. The policymaker confirms that this is one of the challenges facing the further implementation of the CRP. Additionally, designated areas for loading and unloading should be provided to accommodate those carrying heavy items.

As demonstrated in the preceding section, the P+R concept emerges as a viable alternative for the majority of participants. However, it is constrained by two limitations: the elevated costs associated and the necessity to traverse the final segment of the journey on foot.

Participant 5 emphasized that the reduction of cars in the city centre would pose considerably less of a challenge if improvements were made to the bus and cycling routes to Middelstum. The primary reason individuals opt for car transportation over bus or bicycle is attributed to the inadequate connectivity of Middelstum as a village. This sentiment is underscored by the following quote: *"If there were a bus that simply took the car route and*

did not stop too often. Even if it's only during rush hour. Or, for example, there would be a bicycle highway like many villages have, instead of cycling the first part from Middelstum through the fields. I think that would ensure that many people would travel less by car."
Figure 10 provides an overview of all the participants' interview answers.

Theme	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5
Travel purpose	Leisure, cultural events	Leisure, visit friends	Leisure, as a transfer point to family in The Hague	Now only leisure but until 1 year ago for work	Multiple purposes: health care, child's school and sports, leisure
Travel frequency	6/8 times a year	Once a month	6 times a year	5/6 times a year. Before: 5 times a week	4/5 times a week.
Mode(s) of transport	Most car, sometimes bus	(almost) always car	Car or bus	Bike or car, almost never the bus.	Most of the time car, sometimes bike or bus
Deciding factor	Travel time, bicycle unsafety, travel purpose	Travel time	Amount of destinations in the city	Travel time and costs	Travel purpose
Awareness of CRP	No direct involvement, neutral opinion	No direct involvement, makes sense to him	Personal experience when using the bus	No direct involvement, against strict parking rules in outskirts	No direct involvement, would have liked to receive more information
Personal opinion	Nice to have calmness and safety but difficult for people with heavy stuff. Likely to result in changing function in the city centre.	Good for the liveability, difficult for people with mobility issues	More benefits than drawbacks but difficult for people with mobility issues.	Makes it more attractive for cyclists and pedestrians but can imagine people will purchase goods online	Most car traffic is already local traffic. Can influence destinations such as Pathe or local shops.
P+R	An option but relatively expensive while still have to walk last part	Can be an alternative	Realistic option, used it sometimes already	Still can't reach the city centre by bus and it became very expensive	Would rather accept high parking costs in the city centre
Impacts of CRP on travel behaviour	No impact on travel quantity, depends on interesting events and amenities.	No impact because there is no alternative city in the region	Probably no impact because they like to do things	No impact on travel behaviours	For herself no impact but can imagine that it has for others
Other factors	More important is the versatility of the city centre. More regulations of bicycles.	More and better P+R. Take care of less mobile people	Keep places like De Grote Markt available for everyone	Keep some designed places for loading and unloading. Keep P+R affordable.	Focus on a better connection of Middelstum to Groningen through faster bus lines or a faster bike lane.

Figure 10: Schematic overview of interview responses

In summary, people residing in Middelstum primarily rely on cars for commuting to Groningen, with travel time and purpose being the main determining factors. They unanimously agree that CRP would not substantially alter how often they travel. However, they also note that CRP would only moderately affect their choice of transportation mode. They recognize the beneficial impacts of CRP on the urban environment of the city centre. While for some people the well-established P+R system in Groningen is a feasible alternative, others express reluctance to utilize it. Additionally, there are a lot of other factors that could significantly impact the effectiveness of CRP and contribute to fostering a more positive public attitude towards CRP.

5. Discussion

Geurs and van Wee (2004) defined accessibility as the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations, in this case the city centre of Groningen, by means of a (combination of) transport mode(s). With regard to the 'land use component', CRP exerts no immediate influence, as it does not diminish the amount of amenities in the city centre. In fact, reducing the number of cars in the city centre will create more space for other functions and enhance the overall quality of urban space usage. Nonetheless, over the long term, CRP may impact the diversity of retail functions, as retailers specializing in bulky items may opt to relocate from the city centre if customers are unable to access them by car.

In relation to the 'transportation component', CRP has direct negative impact on the accessibility of the city centre. Journeys to the city centre will require individuals to expend more time and effort, while potentially reducing the amount of parking costs. The shift from using cars towards busses to commute to the city centre introduces a minor drawback in the 'temporal component', as individuals become constrained by bus schedules. In relation to the 'individual component', the city centre of Groningen may become less accessible for specific demographic groups due to CRP. Particularly, older individuals, those facing physical challenges, and people with mobility limitations may encounter increased difficulty accessing the city centre. CRP exerts negative impact on the external accessibility of the city centre, as outlined in Lee's theory (2014), which refers to the pathways (groups of) individuals have to traverse to reach a certain place. These pathways become more complicated when motorized vehicle access is reduced in the city centre, affecting both private vehicle accessibility and public transportation access. Loukopoulos et al. (2005) argue that rising car ownership leads to social inequalities. However, the findings of this research indicate that removing cars from the city centre also generates social disparities for individuals who struggle to walk the last leg of their journey. The challenges faced by this group are confirmed by the policymaker.

The results of this research show that, for residents of Middelstum, the positive effects of CRP outweigh the negative impacts on accessibility, resulting in a favourable public attitude towards CRP. Although there is a notable positive attitude towards CRP, the study indicates only minimal effects on people's travel intentions. For a few participants, the P+R system would be a viable alternative, but for most, CRP would not change their preferred mode of transport. However, CRP would not have a significant negative effect on travel frequencies. Since travel behaviours will change minimally while positive attitudes increase significantly, CRP would positively impact the perceived place attractiveness of Groningen's city centre.

This thesis uses qualitative research methods to explore the reasons behind people's attitudes and the political drivers of CRP. Five participants, all living in or near Middelstum, were included in the sample. Middelstum, although close to Groningen, has significantly longer travel times by public transport compared to travel by car. Thus, Middelstum serves as a suitable example of a town with limited public transport connections to Groningen, representing individuals who are more reliant on their cars for commuting to the city. In addition to this research sample, an interview was conducted with a policymaker. This interview is a valuable addition as it provides deeper insights into the drivers behind the CRP and offers a comparison between the goals of the CRP and public perception of the plan. Including participants who face serious mobility issues would enhance the sample. While qualitative research methods are useful for understanding behaviour, combining them with surveys can offer more statistical evidence, especially regarding factors like changes in travel frequency.

Further research can be a broader demographic analysis, analysing attitude differences towards CRP among different demographic groups, focussing on different age groups, socio economic backgrounds or physical abilities. Future research could explore a comparative approach, comparing the implementation of CRP in Groningen with its implementation in another city. This could offer valuable insights into best practices and common challenges. Additionally, studying the economic impacts and attitudes of local entrepreneurs could provide further insight into the political feasibility of CRP. While this study focuses on CRP's social impacts, it would be beneficial to also conduct an environmental impact assessment. In conclusion, conducting a study in a few years to examine responses to CRP and evaluate the policy's implementation would be valuable.

6. Conclusions and recommendations

This thesis has validated that CRP negatively affect the accessibility of Groningen's city centre. However, participants indicated that this does not alter their travel frequency. Other factors, such as bicycle safety and the availability of diverse facilities, have a greater influence on their travel intentions. Some participants may switch transportation modes due to CRP. While most participants find it manageable to complete the final part of their journey on foot or consider the P+R concept as an option, they recognize that this could worsen social disparities for those who struggle with mobility. To encourage greater use of buses or bikes among commuters from Middelstum, faster connections are essential, as travel time emerges as the primary reason for preferring cars over alternative modes of transportation.

All participants recognize the positive impacts of CRP on the liveability, reduction of noise and air pollution, and safety of the city centre. The participants in this research believe that the benefits of CRP outweigh the drawbacks in terms of accessibility, primarily because none of them encounter difficulties in completing the last part of their journey on foot. These beliefs foster a positive attitude among residents of Middelstum towards CRP, though they do not significantly alter their travel intentions. In conclusion, this research suggests that CRP in Groningen predominantly yields positive effects on the place attractiveness of the city centre, especially for physically healthy individuals. However, for those with significant mobility challenges, the reduced place accessibility is likely to outweigh the positive impacts on the human environment.

Although the CRP will not influence travel frequency for commuters from Middelstum, it also has limited impact on their mode of transport. Most participants will continue to use the car as their primary means of travel. P+R can be an alternative for some, provided it is affordable. However, for participants to consider using public transport for the entire journey, bus travel times would need to decrease significantly. Therefore, CRP will not significantly change the travel intentions of people residing in places with limited PT connectivity.

Finally, this research offers valuable insights for future policy planning aimed at reducing car usage and enhancing the overall attractiveness of the Groningen city centre. Crucial considerations include: diverse amenities within the city, accessible and cost-effective park-and-ride (P+R) and public transportation (PT) options, enhanced regulations for bicycle usage and parking, designated loading and unloading areas, alternative means of reaching the city centre for those with limited mobility, and improved provincial connections from Middelstum to the city centre via better bus and bicycle routes.

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