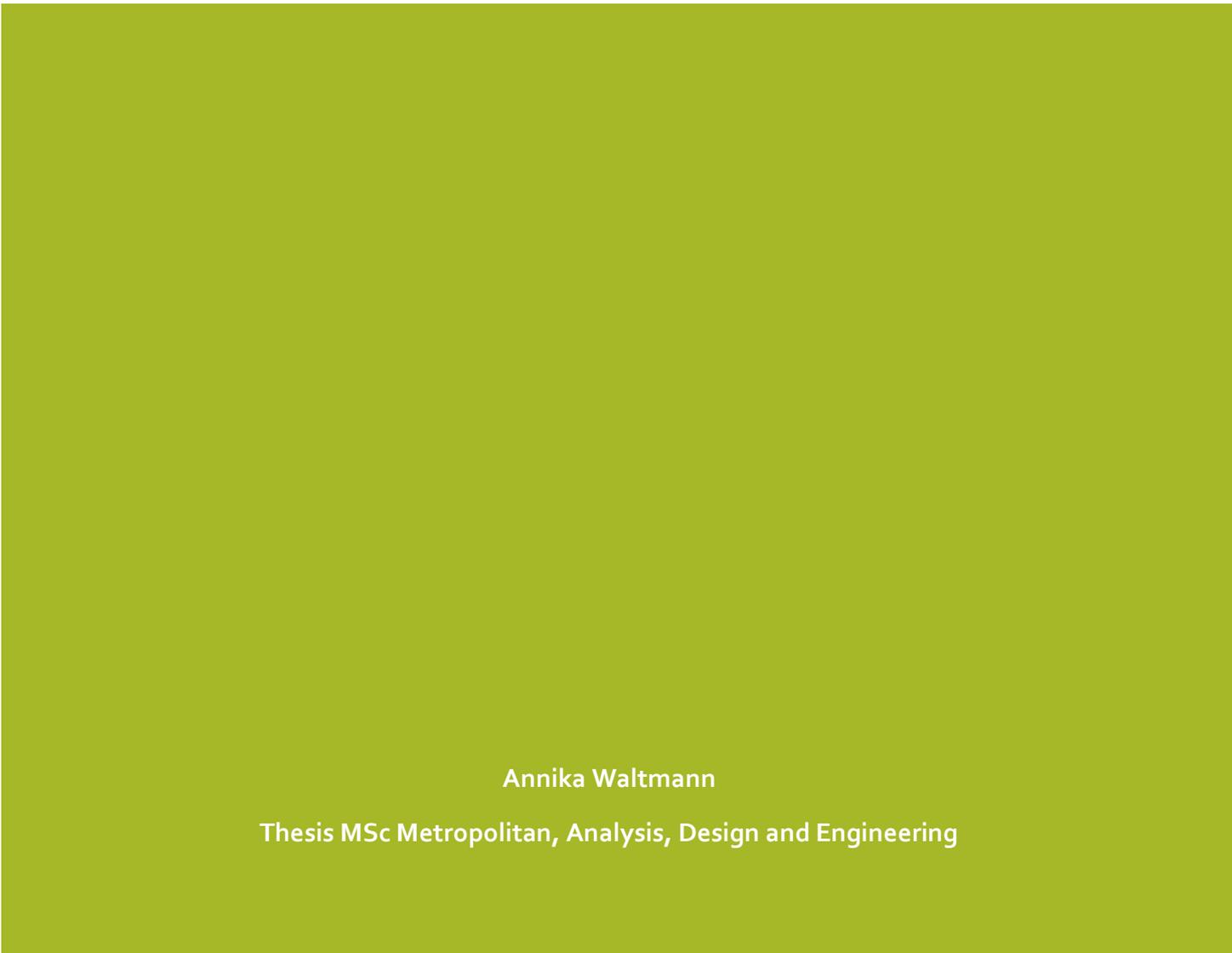




CAR-USE REDUCTION IN CAR-CENTRIC PURMEREND

Applying Behavioral Change Models to
Promote Sustainable Transportation



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Preface

Over the past eight months I have enjoyed working on my thesis on reducing car-use in Purmerend. I chose this topic because of my interest in sustainable mobility in urban environments. Excessive car-use in cities poses a challenge that many modern urban areas face. Purmerend is one of these cities actively working to reduce car-use to create more space in the city.

This thesis was written to complete my MSc Metropolitan Analysis, Design and Engineering at Wageningen University and Technical University Delft. During my graduation period, I chose to do an internship at the Municipality of Purmerend, which gave me the opportunity to gain valuable experience within a local government organization and find out whether this line of work fits me. While writing my thesis, I learned a lot about conducting quantitative research. Although I had encountered this during my education, I had not yet delved deeply into it. This turned out to be a very valuable challenge from which I learned a lot.

I would like to thank my supervisors from WUR and TUDelft, Karin Peters and Marco Rinaldi, for their guidance. During this period, they were always ready to answer my questions and provide me with structured and useful feedback on my drafts. In addition, I would like to thank my supervisors at the Municipality of Purmerend, Sjors Onneweer and Peter de Graauw. They welcomed me into the Landscape and Urban Planning team, helped me with all my questions and put me in touch with colleagues within the municipality. I would also like to thank the other colleagues at the Municipality of Purmerend who supported me with their time and knowledge.

I am happy to present my final work and complete 6 years of education. After this I will enter a new stage in my life where I will work at the municipality of Purmerend as a mobility policy maker and work on similar mobility topics in the professional field.

Abstract

This thesis explores the potential for reducing car-use in development area Waterlandkwartier in Purmerend, with a particular focus on soft measures. Using the stage model of self-regulated behavioral change (SSBC) (Bamberg, 2013b) as a framework, this thesis identifies internal factors influencing residents' mobility choices and assesses how soft measures can be effectively implemented to encourage a shift away from car centrality. Additionally, Michie et al.'s (2011) behavioral change wheel was added to the framework to comprehend the external factors that could also influence behavior. A survey conducted among local residents revealed specific areas of focus, including social norms, personal norms, and perceived behavioral control. A comparison with other municipalities and an analysis of existing literature highlighted that while Purmerend's planned hard measures are common, they need to be complemented by soft measures to reduce resistance and encourage voluntary behavioral change. It is recommended that the municipality of Purmerend implements soft measures to complement existing hard measures from their mobility program of requirements (2022a). The soft measures include social norms marketing to normalize reduced car-use by spreading messages that highlight desirable behavior, and antecedent strategies to raise awareness about the negative impacts of car-use on public space, encouraging shifts in personal norms. Residents should be encouraged to set specific, achievable goals for reducing car-use. For shared mobility specifically, mastery and vicarious experiences should be provided through events and media, this can increase perceived feasibility and perceived behavioral control. These findings contribute to the broader conversation on sustainable urban mobility and offer valuable insights for other cities aiming to implement measures to reduce car use.

Key words: car-use reduction, behavioral change, alternative modes of transportation

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1. Introduction

Cities worldwide are increasingly prioritizing the use of more sustainable alternative modes of transportation and trying to reduce the use of the private car. The private car has a significant contribution to air pollution and is inefficient in its use of space (Zong et al., 2015). The infrastructure for private cars, such as roads and parking spaces, uses a lot of urban space that could otherwise be used for public greenery or other public functions. As municipalities try to repurpose parts of the areas dedicated to cars for the benefit of the citizens, they focus on influencing the behavior of citizens towards reducing their private car-use.

This thesis is about the residents of development area Waterlandkwartier in Purmerend, and how their mobility behavior can be influenced towards using more alternative transportation modes and less private cars. The forms of alternative transportation looked at are walking, cycling, public transportation, and shared mobility. The municipality of Purmerend aims for the residents of Waterlandkwartier to reduce their car-use, creating more space for new housing, greenery and other functions in public space. This thesis answers two research questions: 'What is the current mobility behavior of the residents of Waterlandkwartier, and what factors influence this behavior?' and 'What measures can be implemented to reduce car-use among residents in Waterlandkwartier?'

Behavioral change is a challenging topic, and much research has already been done to try to understand how and why people change their behavior. This led to many theories about behavior and behavioral change in the field of mobility and reducing car-use. Chng (2021) researched which behavioral change theories are used most in research about changing mobility behavior. He found that traditional behavioral change theories, that are well established, are used most often. He argues that traditional theories are good at describing behavior, but that they all have their limits and are more reliable when combined. Theorists have attempted to combine the theories into comprehensive models. One of these models is the stage model of self-regulated behavioral change (SSBC) by Bamberg (2013b). This model combines three traditional behavioral change theories into one. Much literature can be found about different models, and how they work, but very little literature can be found about how useful the models are in empirical research to find suitable behavioral change measures for cities to implement.

This thesis aims to contribute to literature by providing insights into the use of one of these comprehensive models. The chosen model is SSBC, and this model is applied to a case in Purmerend, The Netherlands. Additionally, the thesis aims to provide practical policy measures for the municipality of Purmerend to influence the residents to reduce their car-use and provide a roadmap for other municipalities that want to reduce car-use.

1.1 Context

Purmerend is one of the municipalities that aims to reduce car-use in the city. Purmerend is a city North of Amsterdam and aims to grow from 95.163 residents (Gemeente Purmerend, 2024) to 100.000 residents by 2030. The municipality of Purmerend (from now on referred to as the municipality), is therefore aiming to densify the city and expand around the city borders. One of the development projects for densifying within the city is called Waterlandkwartier. This project aims to transform the train station area called Waterlandkwartier, see Figure 1, into an extension of the current city center (Gemeente Purmerend, 2022b). Waterlandkwartier is the name of the development project and is not a name of a current neighborhood. The area Waterlandkwartier is a part of the neighborhood Gors-Noord.

The Municipalities vision for Waterlandkwartier is that it will be transformed into a dense, mixed environment where people live, work and recreate. A total of 1800 housing units will be added to the area. The municipality aims for an urban area with many nearby facilities. The municipality also wants Waterlandkwartier to become a nice place for recreation and meeting others. To realize the plans to densify the city, a lot of space is needed and in the current situation a lot of space is dedicated to cars. The area currently has a very car-centric character. To create space for the new plans, the space for cars needs to be limited, and therefore car-use and car ownership needs to decrease.

The municipality adopts the 'STOMP-principle'. This is a Dutch principle that stands for *stappen, trappen, openbaar vervoer, mobility as a service (MaaS), and privéauto* (in English: stepping, pedaling, public transportation, mobility as a service, and the private car) (CROW, 2020). The principle shows which modality should be prioritized over another in urban areas. The order shows the priority of the modality. Walking has the highest priority, followed by cycling, using public transportation, MaaS, and the private car (CROW, 2020). MaaS (Mobility as a Service) refers to the planning, booking, and payment of various transportation options through apps, such as shared bikes, cars, scooters, trains, trams, taxis, or even personal vehicles. It allows for seamless, door-to-door travel tailored to the user's preferences and aims to improve the overall mobility system (Ministerie van Infrastructuur en Waterstaat, 2024). To follow this principle, it is important that alternative modes (modes other than the private car) are stimulated. The municipality has already formed goals to improve the alternatives. Walking can be stimulated by improving sidewalks and densifying the area with daily amenities at walkable distances. Cycling can be stimulated by improving the bike lane network, and by creating direct, attractive, and safe bike lanes. The municipality aims for public transportation to be a good alternative to the private car, by connecting the area to the rest of the region by frequent busses. Shared mobility will be improved by placing shared vehicles prominently in the area and making them an affordable and adequate alternative for the private car. Mobility hubs will be built, where different forms of shared mobility can be found, and people can park their car and bike among other things.

Besides these measures, the municipality is also implementing measures to make the private car-use and ownership less attractive. In the new built areas, the parking standard will be much lower than in the current situation, parts of the area will be car-free. Throughout the area, many on-street parking spaces will be removed, and mobility hubs will be built for parking and shared mobility among other things. This will make people walk a longer distance to their car, and can make the car less attractive (Gemeente Purmerend, 2022a). All measures mentioned by the municipality are focused on external changes and not on influencing people's internal beliefs.

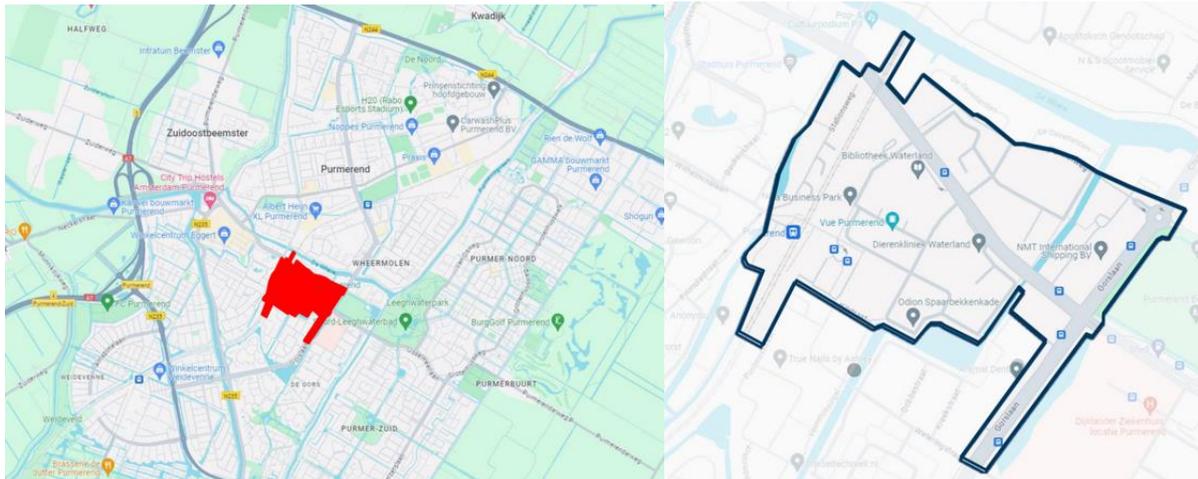


Figure 1 Location Waterlandkwartier in Purmerend and area Waterlandkwartier (Own work; background: Google Maps, 2024)

1.2 Problem statement and goal

Besides the new 1800 new housing units, around 500 housing units remain in the area (Gemeente Purmerend, 2022a). Many current housing units will be removed and rebuilt. New residents will be aware of the low-car characteristic of the new Waterlandkwartier and that they will move to an area where alternative modes of transportation play a much bigger role than in the current situation. This is however not the case for the current residents. The current Waterlandkwartier is very car-centric. There is a lot of space available for the car in public space, and most residents use their car for most trips, even for small trips (Gemeente Purmerend, 2022a). This car-centric behavior is contradictory to the aims of the municipality and might hinder the development in the area, because the space used by cars is needed for the development. Besides this, the Waterlandlaan, which is the most important road for car access in the neighborhood, is reaching max capacity. Currently, around 16.000 motor vehicles use the Waterlandlaan per day. Road types like the Waterlandlaan with a single lane per direction can handle approximately 18.000 vehicles. The Waterlandlaan also has intersections which make the max capacity even lower than 18.000 (Gemeente Purmerend, 2019). With the increase in residents in Waterlandkwartier, and Purmerend in general, it is possible that the road might reach max capacity, causing congestion.

Behavioral change theories offer valuable insights for addressing these challenges. Bamberg's Stage Model of Self-Regulated Behavioral Change suggests that behavioral change occurs in phases, influenced by factors like problem awareness, perceived responsibility, and personal norms (Bamberg, 2013b). This model can be complemented by Michie et al.'s (2011) Behavior Change Wheel because this by emphasizes the role of external factors, such as accessibility and cost. Despite the promise of these frameworks, there is a gap in empirical research applying them to design car-use reduction measures for cities.

By using the Stage Model of Self-Regulated Behavioral Change and the Behavior Change Wheel to analyze car-use behavior in Waterlandkwartier, Purmerend, this thesis seeks to close this gap. This study lays the groundwork for customized measures. In line with the municipality's overarching goals, the goal is to provide evidence-based policies that reduce the use of cars and encourage sustainable alternatives.

1.3 Reading guide

This thesis explores reducing car use in Purmerend's Waterlandkwartier. Chapter 1 introduces the research context and objectives. The second chapter provides the theoretical foundation, using behavioral change models to frame the study. In Chapter 3, the methodology explains how a survey was used to investigate residents' mobility behavior, motivations, and barriers to change. Chapter 4 presents findings that identify social norms, responsibility, and alternative feasibility as key factors influencing car-use. Chapter 5 offers policy measures, combining internal (soft) and external (hard) measures to encourage a shift toward sustainable mobility. Chapter 6 concludes with insights for Purmerend and other cities aiming to reduce car dependency. Chapter 7 provides practical policy recommendations to the municipality of Purmerend.

2. Theoretical framework

This chapter explores different behavioral change theories that can be applied to research car-use reduction. Behavioral and behavioral-change theories are often used by researchers when studying mobility behavior. Studying this behavior can provide insight into what influences mobility choices. This, in turn can be the base for informing policymakers on what measures should be implemented to influence people's mobility behavior. This chapter first explains the stage model of self-regulated behavioral change by Bamberg (2013b), including the theories it is based on. It then describes the different types of policy measures and how they are categorized. Next, it discusses the factors that influence behavioral change and how these insights can guide the design and selection of effective policy measures. Finally, the chapter introduces the Behavior Change Wheel (BCW) by Michie et al. (2011) as an enhancement to SSBC.

2.1 Stage model of self-regulated behavioral change

Different behavioral change theories have been used in mobility research for a long time. Hoffman et al. (2017) and Chng et al. (2018) identified the most used ones. They both found that theories that were made before 2000 and are well-established in behavioral science, are applied most frequently (e.g. the Theory of planned behavior (TPB) and Norm activation model (NAM)).

Although the established theories are useful when studying behavior, they have their limitations. Chng (2021) argues that established theories are most helpful in explaining behavior when combined, providing a more comprehensive model. Bamberg (2013b) combined four traditional behavioral change theories into one comprehensive model called 'The stage model of self-regulated behavioral change'. This thesis can benefit from such a comprehensive model, because it considers a broader spectrum of factors that could influence complex behavior. Mobility behavior is a complex behavior and cannot be fully understood with one singular theory. Combining these theories can overcome some of the limitations of traditional theories. Stage models are particularly suitable when investigating how to encourage voluntary behavioral change, e.g. in the context of environmentally friendly behavior. Bamberg (2013b) combined the model of action phases, the theory of planned behavior, habit theory, and norm activation model to form SSBC. Therefore, the following sections describe these four models and how they integrate in SSBC.

Model of action phases

SSBC is largely based on the model of action phases (MAP) (Heckhausen & Gollwitzer, 1987; Gollwitzer, 1990 as cited in (Keller et al., 2020)), see Figure 2. MAP focuses on the phases an individual would go through in order to successfully reach an intended goal. The underlying theory argues that behavioral change can be divided into four phases. The first phase is the pre-decisional phase, in which people deliberate the desirability and feasibility of goals. The second phase is the pre-actional phase, in which people plan strategies for achieving their goals. This is followed by the third phase: the actional phase, in which people enact their plans to achieve their goals. The last phase is the post-actional phase. In this phase people evaluate their achieved outcomes and try to prevent falling back into the old behavior. The model of action phases is included in SSBC in its entirety.

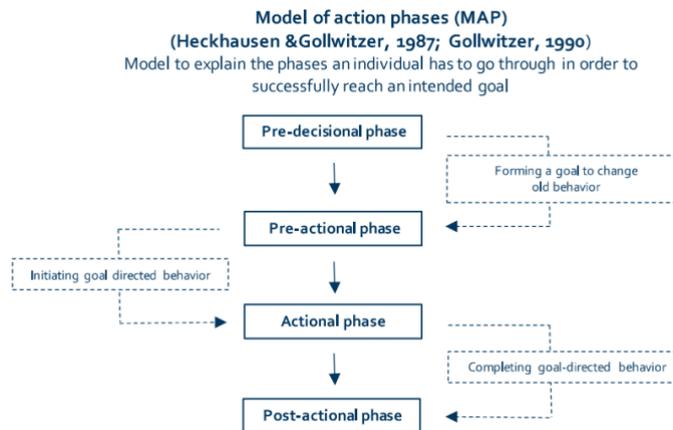


Figure 2 MAP (own work, based on Heckhausen & Gollwitzer (1987) and Gollwitzer (1990))

Theory of planned behavior

Next to MAP, several aspects of the theory of planned behavior (TPB) (Ajzen, 1985; Ajzen, 1991), see Figure 3, are included in SSBC. TPB is designed to predict behavioral intention. It argues that behavioral intention can be predicted by measuring attitude, subjective norm, and perceived behavioral control. Attitude refers to how positively or negatively an individual feels about carrying out a desired behavior, subjective norm is about individual's opinions about other's norms regarding a desired behavior, and perceived behavioral control is about individuals' sense of control over performing said behavior. SSBC partially follows TPB by viewing attitude and perceived behavioral control as determinants of behavioral intention. Subjective norm is called salient social norm in SSBC, and is not seen as a direct determinant of behavioral intention. It is instead considered as an indirect determinant of intention, by influencing one's personal norms (Bamberg, 2013b).

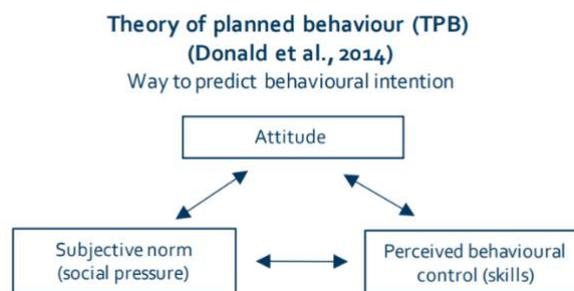


Figure 3 TPB (own work, based on Donald et al. (2014))

Habit theory

Habit theory is the third aspect that is included in SSBC. Habits are automatic decisions that allow for uninterrupted action, sparing cognitive resources, and guaranteeing that actions are consistently remembered and executed (Orbell & Verplanken, 2020). Research has shown that TPB can benefit from the addition of domain specific factors. Habit is an important extension of a given behavioral model when predicting transportation mode choice (Donald et al., 2014). The original TPB assumes that choices are made with intention, but when behavior is repetitive and frequent (like transportation) it is likely that that people do not make intentional, but rather habitual decisions (Verplanken et al., 2008). As with the adjusted TPB, SSBC also embeds habit theory. There are three key elements of forming a habit: the history of repeating actions in a consistent situation, connecting cues with responses in memory, and actions being dependent on cues (Donald et al., 2014). When it

comes to habits and car-use, there is a relationship between information seeking and habit strength. Different research efforts demonstrated that a strong preference for car-use is typically associated with reduced information seeking behavior and a restricted use of information when making transportation decisions. A trade-off between intention and habit was also discovered. If the habit of choosing the transportation mode is weak, intention is found to be a better predictor of behavior (Klößner et al., 2003).

Habit theory, as explored by Gardner et al. (2024), offers a robust framework for understanding and influencing behavioral change, particularly in the context of reducing car-use. Habit theory is important for designing policy measures aimed at both reducing car-use habits and increasing the use of alternative transportation. The theory highlights that while habits can overpower intentions, especially when they are strong and not challenged by other impulses, they can also coexist with intentional actions, facilitating behaviors that are both habitual and deliberate. This dualistic nature shows the potential for measures that target both habitual and intentional aspects of behavior, providing a structured approach to encourage lasting change. The application of habit theory could therefore inform strategies that effectively alter transportation habits, promoting a shift towards decreased car-use and increased use of alternative transportation.

Norm activation model

The last theory that was used for SSBC is the norm activation model (Schwartz, 1977), see Figure 4. TPB is often used in combination with the norm activation model (Chng, 2021). NAM aims to explain and predict pro-environmental behavior, such as choosing alternative modes of transportation over the private car. The model describes the prerequisites that people must meet in order to participate in prosocial behavior, especially when it comes to choosing environmentally friendly behavior. The first step in the process is awareness of need. People need to acknowledge how their actions affect the environment. Awareness of consequences and perceived responsibility come next. People need to recognize the consequences of their actions and take responsibility for them. Last is outcome efficacy, this is people's sense of control over the circumstance and their belief that they can make a difference. This is shaped by societal expectations. When these four requirements are met, personal norms, which represent a natural moral obligation that aligns with an individual's principles, become active. However, activating personal norms does not always guarantee prosocial behavior, as individuals may choose to put their own interests above their moral obligations. This can in turn lead to denial of responsibility, and ultimately negative consequences. These coping mechanisms have been linked with lower environmental efficacy and pro-environmental behavior, which validates the NAM's principles (Møller et al., 2018). MAP and TPB do not consider social cognitive and emotional factors in depth, which would be useful for the development of behavioral change measures according to Bamberg (2013b). Hence, NAM was added to the stage model. By addressing the social cognitive and emotional factors that influence behavior (Bamberg, 2013b), SSBC enables the development of more effective soft measures for promoting environmentally friendly behavior.

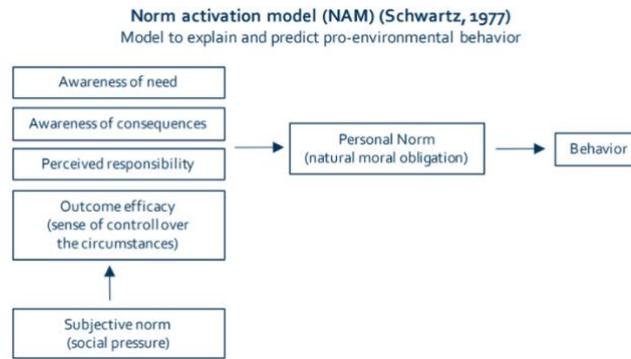


Figure 4 NAM (own work, based on Schwartz (1977))

Overview SSBC

The stage model of self-regulated behavioral change (Bamberg, 2013b) theorizes how individuals go through four phases when changing behavior. The first phase is dubbed *the pre-decisional phase*. In this phase, people perform the undesired behavior on a regular and habitual basis. They have no intention of changing this behavior. During this phase, individuals are influenced by six factors. These factors are (1) awareness of negative consequences associated with the undesired behavior, (2) perceived responsibility, (3) negative emotions, (4) personal norm, (5) emotions anticipated with goal progress, and (6) perceived goal feasibility. Individuals are indirectly influenced by social norms, as the latter influence personal norms. When an individual forms a personal change goal, they move on to *the pre-actional phase*. In this phase, individuals have an intention to change their behavior, and plan how to implement the change. During this phase, individuals are influenced by their attitude over the alternative behavior and their perceived behavioral control over the alternative behavior. Once individuals begin executing their behavior-altering plan, they are in *the actional phase*. In this phase individuals are influenced by self-efficacy. The last phase is *the post-actional phase*. During this phase, individuals perform the new behavior and work on maintaining the behavior so as not to fall back into old habits. Figure 5 provides a visual overview of SSBC.

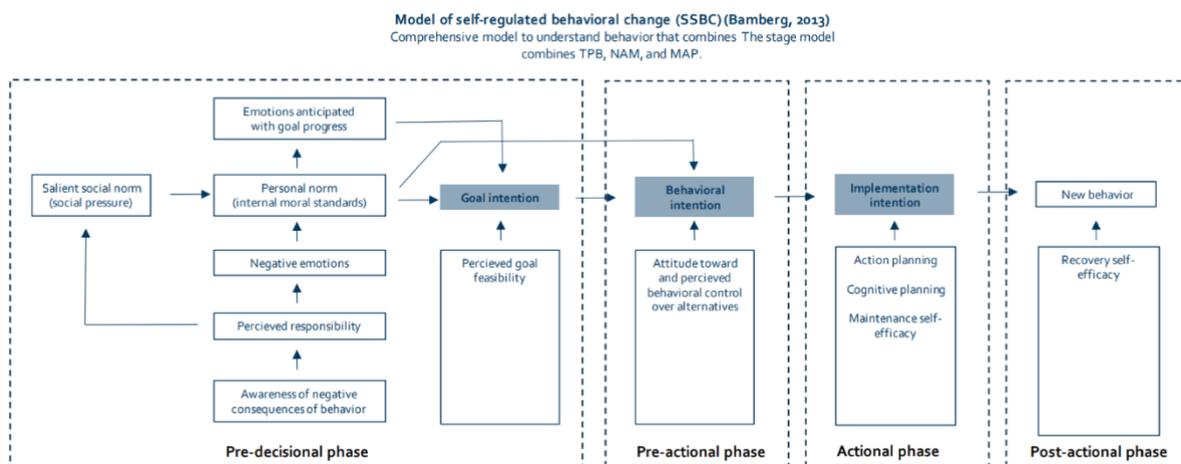


Figure 5 SSBC (own work, based on Bamberg (2013b))

2.2 Categorizing measures

In the field of behavioral change, various strategies are used to foster shifts towards more sustainable behavior. Literature has categorized these strategies into distinct types of measures. One common way is to divide them into hard measures and soft measures. Hard measures are measures that change the physical environment or other external things. This could be changing infrastructure or changing the cost of alternatives. These hard measures often lead to public resistance, political concerns and are sometimes financially unfeasible (Cairns et al., 2008). Lately the second type of measures, soft measures, or psychological measures, have become more popular (Bamberg et al., 2011). Soft measures aim to influence people's beliefs, perceptions, and attitudes (Hsieh et al., 2017). They are also referred to as voluntary change measures since they involve information provision and persuasion techniques to influence people towards switching to sustainable modes of transportation (Loukopoulos, 2007). Frequently implemented soft measures are travel awareness campaigns, workplace travel plans (encouraging people to travel to work sustainably), school travel plans (encouraging sustainable school drop-offs and pick-ups), personalized travel planning (encouraging sustainable mobility use for all trips), and public transport marketing (Cairns et al., 2008). Cairns et al. (2008) show that soft measures are most effective when implemented alongside hard measures. The authors argue that the implementation of both soft and hard measures can increase the speed at which behavior changes.

Measures can be further categorized into push and pull measures. In concise terms, push measures are aimed at making the undesirable behavior less attractive, whereas pull measures are aimed at making the desired behavior more attractive (Fujii et al., 2009). Sørensen et al. (2014) refer to push and pull measures as 'sticks and carrots'. They show how combining push and pull measures is an effective strategy to lower resistance to change. People are found to be more likely to accept push measures when pull measures are also in place. Sørensen et al. (2014) also note that it can be effective to implement the pull measure a few months before the push measure rolls out. This way people can get used to their new opportunities/options before the push measure introduces constraints on their habitual choices. London and Stockholm were used by the authors as examples, as in both cities public transportation was improved a few months prior to the introduction of a new driving charge (congestion charging). This gave people the chance to adjust their travel behavior gradually.

2.3 Factors and policy measures

SSBC describes factors that have an influence on behavioral change. Bamberg (2013a) argues that policy measures aimed at changing environmental behavior should be based on these factors. In this case, the different factors can be used to design policy measures to reduce car-use. Schaffner et al. (2017), who employed SSBC to understand resident's decisions to move into energy efficient homes, used eight of the factors in SSBC to design their research. These were: *negative emotions*, *perceived responsibility*, *problem awareness*, *social norm*, *personal norm*, *attitude*, *feasibility*, and *perceived behavioral control*. In this thesis, the same factors are used. In this paragraph, these factors, and how they can be used to design measures aimed at reducing car-use are explained in greater detail. Besides policy measures based on these eight factors, Bamberg (2013a) further recommends policy measures based on goal setting, as forming a goal is considered a prerequisite for moving to a higher phase of behavioral change.

Negative emotions

The factor negative emotions refers to how an individual feels towards the undesired behavior (in this thesis: car-use), and whether they feel negatively about it (Bamberg, 2013b). Examples of negative feelings are guilt, fear, and shame. Williamson and Thulin (2022) conducted research on utilizing emotion-based measures to support environmental behavioral change, they gave a few examples of

measures based on negative emotions. Measures can focus on fear, this is often used in health campaigns. An example of this is informing people about the consequences that smoking has on the body. Another measure based on negative emotions is based on shame. People can be informed about how their actions result in the disapproval of others. This can influence people towards avoiding the undesired behavior, to avoid disapproval of others. Increasing negative emotions, is thought to influence behavioral change according to Bamberg (2013a).

Perceived responsibility

Perceived responsibility refers to an individual's belief or perception that they are personally accountable for a specific behavior and outcomes (Ajzen, 1985; Ajzen, 1991). In this context, perceived responsibility is whether an individual feels that their personal car-use, and its reduction, have an effect on the environment and on others. According to TPB, perceived responsibility can influence intentions to perform a certain behavior, particularly when individuals believe their actions will have a meaningful impact on outcomes (Ajzen, 1985; Ajzen, 1991). Čapienė et al. (2022) conducted research on the influence of perceived responsibility on engagement in sustainable consumption. They found that educational campaigns and policy frameworks that emphasize individual responsibility have a positive effect on the awareness and can stimulate behavioral change.

Problem awareness

The factor problem awareness refers to whether individuals think that the behavior they are performing is associated with problems and is undesirable (Bamberg, 2013b). In this thesis's context, this captures whether people are aware of the negative consequences of car-use. This acknowledgement often involves negative emotions (e.g. shame). Measures based on problem awareness involve increasing the awareness of the problems (negative externalities) associated with the undesired behavior. These measures are similar to those based on negative emotions.

Social norm

Social norms define the behaviors considered appropriate within a specific context, based on the shared beliefs of a group or community (Lahlou, 2017) as cited in (Yamin et al., 2019). A group is any collection of people who interact either directly or indirectly. A community typically represents a larger group of people who live close to one another and share common cultural or social ties. Measures based on social norm have become more popular in the last years and have been validated as a cost-effective way to influence sustainable behavior (Yamin et al., 2019). Measures based on social norm are e.g. the social norm marketing approach, personalized normative feedback, and focus group discussions. These measures all focus on the current positive behavior and opinions of the community. In the context of this thesis, the focus should be on people in the community that have already reduced their car-use, and sharing their opinions and experiences to inspire others to also reduce their car-use (Miller & Prentice, 2016; Kormos et al., 2014).

Personal norm

Personal norm refers to an individual's own moral principles and what they think is right or wrong in certain situations. The reason for an individual to follow their own personal norm is to avoid self-related feelings such as fear of guilt or regret (Bamberg et al., 2007). Measures based on personal norms aim to change a person's idea of what is right or wrong, this can be done through personalized feedback, antecedent strategies and encouraging people to make a commitment to change their behavior. Personalized feedback is about reflecting on past behavior, antecedent strategies are about raising problem awareness and informing about consequences of the undesired behavior, and making a commitment is making people promise to others or themselves to change their behavior (Steg & Vlek, 2009; Abrahamse et al., 2007). In the context of this thesis, people could be encouraged

to form a commitment to reduce their car-use or be confronted with personalized feedback about their own car-use.

Attitude

Maio and Haddock (2010) define attitude as an overall evaluation of something that is based on cognitive, affective, and behavioral information. In simple words, this means whether people like or dislike something. In relation to SSBC, attitude refers to people's opinion about the alternatives of the undesired behavior (in this context: opinions about alternative modes of transportation). Measures based on attitude aim to make people's opinions of the alternatives more positive (Schaffner et al., 2017). Giuntoli et al. (2024) conducted research about interventions aimed at changing attitudes. They concluded that interventions based on information and behavioral experience increased positive attitudes. In the context of reducing car-use, this could be spreading positive messages about sustainable alternative transportation modes.

Perceived feasibility

Perceived feasibility is an individual's belief that they can or cannot change their behavior in order to reach a certain goal (Warner & French, 2020). It is about the overall perceived possibility of achieving a goal. As the description suggests, an individual needs to first form a goal before perceived feasibility is relevant. A common theme in the literature is that perceived feasibility is a key predictor of intention. This implies that stronger feasibility leads to stronger intentions and a higher likelihood of performing the behavior. This highlights the central role of the factor in various theories and its potential as a base for policy measures for behavioral change (Warner & French, 2020). Examples of policy measures based on feasibility, are mastery and vicarious experience. Mastery experience is giving people the opportunity to try the alternative behavior during for example a workshop or during an event. Vicarious experience also gives people experience, but this time through watching others perform the alternative behavior. This can increase confidence and can make people feel like they are capable of changing their behavior (Warner & French, 2020; Michie et al., 2013).

Perceived behavioral control

Perceived behavioral control refers to a person's belief in their ability to perform a particular behavior. In the case of this thesis, this is about the alternatives to using the private car. Perceived behavioral control is influenced by internal factors (such as skills, knowledge and abilities) and external factors (like time and opportunity). Measures based on perceived behavioral control are similar to those based on feasibility. Mastery experience and vicarious experience give people the opportunity to gain more confidence in performing the alternative behavior. This can increase the perceived behavioral control (Warner & French, 2020; Michie et al., 2013).

Goal setting

Understanding the phases of behavioral change is crucial for implementing effective measures. What separates people in the pre-decisional phase, from people in pre-actional phase, is whether they have formed a personal change goal. This is very important for people to move to a more advanced phase of behavioral change. For some of the measures above, it is mentioned that people first need to have formed a personal change goal before the measure is effective. Bamberg (2013b) also recommends taking measures based on goal setting when people are in the pre-decisional phase. Goal setting measures revolve around helping people to form a goal and to help them to plan how they will achieve their goal.

2.4 Measures per phase of behavioral change

In Bamberg's second publication about SSBC (2013a), he provides guidelines to change behavior during the different phases of behavioral change. He argues that during the pre-decisional phase, people often perform habitual behavior. Measures should therefore focus on enhancing the awareness of the problem, increasing perceived responsibility, emphasizing the desired behavior as the social norm, increasing perceived ability to change and promoting the formation of a personal change goal. It is important not to ask people for big changes, as that might result in resistance. To reduce resistance, acknowledging that people might feel resistance and minimizing the request, has been found helpful (Pratkanis, 2011). Minimizing the request could for example be done by asking people to change their behavior only once a week, instead of everyday (e.g. meatless Monday when it comes to reducing meat consumption).

In the pre-actional phase it is assumed that people have already formed a goal to change their behavior. In this phase, behavioral change measures should focus on providing more information about the pros and cons of the alternatives and feasibility of the alternatives. In the actional phase, measures should focus on helping people to plan the action of changing their behavior as concretely as possible. Besides this, it might help to give information about the positive consequences associated with the new behavior. Lastly, it is deemed beneficial to give people in the actional phase information that can help them to overcome potential barriers. In the post-actional phase, measures should focus on providing people with feedback on the success of fulfilling their change goal and to help them cope with temptations to fall back into old behavior (Bamberg, 2013a).

2.5 Barriers to behavioral change

While SSBC focuses on emotional and cognitive factors, such as perceived feasibility, problem awareness, and personal norms, it does not fully consider the physical and external factors that can hinder behavioral change. Barriers like time and comfort can be a great influence and can hinder behavioral change (Michie et al., 2011).

The behavior change wheel (BCW), developed by Michie et al. (2011), is a framework used to design and implement behavioral change measures. BCW integrates various behavioral theories to offer an approach to understanding and influencing behavior. At the core of the BCW is the COM-B model, which posits that three components are necessary for behavior to occur: capability, opportunity, and motivation. SSBC partially aligns with the COM-B model, as it incorporates capability in perceived behavioral control, and captures motivation with many other factors such as problem awareness. SSBC however focusses on emotional and cognitive factors and rather overlooks external barriers.

External barriers can however play a significant role in hindering behavioral change from car-use to alternative transportation modes. Research highlights that factors such as time, cost, accessibility, and comfort are important barriers that can influence an individual's decision to (not) shift away from using the private car. For example, high costs associated with public transportation, and the inconvenience and time required for alternative modes like cycling or walking, can prevent individuals from making the shift (Luiu et al., 2018). Additionally, the lack of accessible and well-maintained alternatives and infrastructure for alternatives can increase dependency on cars (Buehler & Pucher, 2012). These barriers must be addressed to encourage a significant reduction in car-use and increase the use of alternatives (Stradling et al., 2008). Incorporating the Behavior Change Wheel framework into this thesis provides a comprehensive understanding of behavior change by addressing both the physical and external aspects of behavior, such as time, cost, and accessibility alongside the emotional and cognitive aspects described in SSBC. This prevents overlooking key aspects of behavioral change.

3. Methodology

This chapter provides an overview of the research design and methods used to answer the research questions. The goal of this thesis is to explore the mobility behavior of the residents of Waterlandkwartier in Purmerend and how their car-use can be influenced to shift towards more sustainable alternative modes. By applying the stage model of self-regulated behavioral change by Bamberg (2013b), and the behavior change wheel by Michie et al. (2011), this thesis aims to identify behavioral change factors that can inform the development of effective policy measures.

This thesis uses both qualitative and quantitative methods to ensure a comprehensive analysis. Quantitative data, collected through an online survey, seeks concrete, numerical insights by measuring current transportation habits and opinions among residents. This method is crucial for establishing a broad, empirical base for the study, allowing for the identification of general trends and statistical patterns. Qualitative data is gathered by reviewing related literature and examining mobility policies from other municipalities, aimed at providing effective policy measure recommendations.

3.1 Research questions

This thesis is guided by two main research questions aimed at exploring the mobility behaviors of the residents of Waterlandkwartier and identifying policy measures that can reduce their private car-use.

1. What is the current mobility behavior of the residents of Waterlandkwartier, and what factors influence this behavior?

The goal of the first research question is to provide a detailed understanding of the current mobility behavior of residents in the Waterlandkwartier area. This includes identifying which modes of transportation they primarily use and what factors influence their choices. This research question also aims to assess in which phase of behavioral change residents are. Besides the emotional and cognitive factors of behavioral change from SSBC, four barriers regarding the alternative modes of transportation are assessed, since barriers could prevent people from changing their behavior (Michie et al., 2011).

2. What measures can be implemented to reduce car-use among residents in Waterlandkwartier?

The second research question aims to identify practical policy measures that could encourage a shift away from private car-use to alternative transportation modes. The purpose is to explore measures that could be applied to influence residents' mobility behavior. Measures that the municipality of Purmerend aims to implement, measures taken by other municipalities, and soft measures from literature are explored. This makes it possible to give well-considered policy recommendations.

3.2 Hypotheses

Based on documents from the municipality of Purmerend (Gemeente Purmerend, 2022a; Gemeente Purmerend, 2022b), where they explain the current situation, and the stage model of self-regulated behavioral change (Bamberg, 2013b), a primary hypothesis and eight secondary hypotheses were formulated. The hypotheses are formulated to make specific predictions based on prior evidence or theoretical argument.

Primary hypothesis

The main expectation for the results of the survey, is that the majority of residents predominantly use their cars for most of the trips and do not plan on reducing their car-use. This would indicate that most residents are in the pre-decisional phase of SSBC as described by Bamberg (2013). This expectation is based on the mobility plan of action (2022a) from the municipality of Purmerend, where they explain that car-use and car ownership are high in the area and that for most people, the car is their primary form of transportation.

Secondary Hypotheses

In addition to the primary hypothesis, eight secondary hypotheses are formulated based on the SSBC. These hypotheses explain in the relationship between the factors and the likelihood of being in a higher phase of behavioral change within the model. The likelihood of belonging to a higher phase of behavioral change means the chance that an individual is in a more advanced phase such as the actional phase (phase 3) compared to the pre-actional phase (phase 2). The hypotheses are heavily based on the hypotheses formulated by Schaffner et al. (2017), who used SSBC to understand resident's decisions to move into energy efficient homes. Schaffner et al. (2017) formulated eight hypotheses based on SSBC. For this thesis, these hypotheses were adopted and adjusted to fit the context of car-use reduction.

1. The more negative the emotional responses towards car-use, the higher the probability of belonging to a higher phase of behavioral change.
2. The more aware the respondent is of their own responsibility regarding the effects of car-use, the higher the probability of belonging to a higher phase. The more aware the respondent is of problems associated with car usage, the higher the probability of belonging to a higher phase of behavioral change.
3. The stronger the social norms favoring reducing car-use, the higher the probability of belonging to a higher phase of behavioral change.
4. The stronger the personal norms regarding the use of sustainable transportation, the higher the probability of belonging to a higher phase of behavioral change.
5. The more positive the attitude towards alternative modes of transportation, the higher the probability of belonging to a higher phase of behavioral change.
6. The higher the perceived feasibility of using alternative transportation, the higher the probability of belonging to a higher phase of behavioral change.
7. The higher the perceived behavioral control over using alternative modes of transportation, the higher the probability of belonging to a higher phase of behavioral change.

3.3 Survey design

To answer the first research question, an online survey was conducted among the residents of Waterlandkwartier, Stationsbuurt, Wagenweggebied, and the Centrum. The aim of the survey was to gather insights into the mobility behavior of the residents and gain an understanding of the key motivators behind these choices. An online survey was chosen, because this was seen as the most effective method to gain extensive data. Alternative methods, such as in-depth or street interviews, were considered but deemed less appropriate by the municipality due to their limited sample size and the need for direct contact with residents. Through a survey, extensive data can be collected. Besides this, a survey is the most fitting method for research that uses SSBC (Bamberg, 2013b), because data from a large group of people is needed for the model to work. Stationsbuurt, Wagenweggebied, and

the Centrum are the three neighborhoods closest to Waterlandkwartier and the city center, they are incorporated into the scope, to be able to make a comparison between the different neighborhoods. Besides this, Waterlandkwartier only has around 500 households, which would have led to less respondents. See [annex A](#) for all survey questions.

The survey was designed to be as short as possible, so that as many respondents as possible would finish all the questions. The survey could be finished in under five minutes. The survey also used simple wording and explanations for words that might be misunderstood. For example, the definition of shared mobility was given. The survey was carried out in Dutch, so that most residents could easily follow all the questions.

Demographics

The first section is focused on demographics, asking respondents about their age, household composition, and the neighborhood they live in. These questions allowed for comparison of the sample with data from the municipality to assess its representativeness in terms of age and household composition. Additionally, the demographic data helped identify any groups that may require special attention. By asking respondents which neighborhood they live in, it was possible to determine if they live within the research area. This also facilitated comparisons between the different neighborhoods.

Current mobility behavior

The second part of the survey is the current mobility behavior. In this section people were asked about what modes of transportation they use, and for which type of trips they use these transportation modes. On a scale from 1 (never) to 5 (always) the respondents were asked how often they use the transportation mode for commuting, grocery shopping, leisure, and dropping of and picking up children. These trip types were chosen because these are daily activities many people execute. This question was asked for the private car, and the four alternatives: public transportation, cycling, walking and shared mobility. In this section, the respondents were also asked if they have an intention to change their behavior. This question was used to determine in which phase of behavioral change the respondents are.

Factors not regarding alternatives

In the third section, the respondents were asked about 5 of the factors, as mentioned in Table 1, in the form of a statement. Respondents could answer on a scale from 1 (completely disagree) to 5 (completely agree). Besides the 5 factors, the respondents were also asked about their habitual behavior through a statement. The statements are derived from similar statements asked by Wang et al. (2023), Richter and Hunecke (2020), and Hielkema and Lund (2021), who also used SSBC to research behavioral change. Their statements were adopted and adjusted to fit the context of reducing car-use. All three researches used singular statements to measure the factors.

Table 1 Statements about factors not regarding alternatives

Topic	Statement
Negative emotions	Living in the city is less pleasant when a lot of cars are used
Perceived responsibility	My own transportation choices have an influence on the livability of the city
Problem awareness	(Parked) cars take up too much space in the city
Social norm	Most people I know think that cars should be used less
Personal norm	My own norms and principles motivate me to use the car less, regardless of what other people think

Factors and barriers regarding alternatives

The three remaining factors, perceived behavioral control, feasibility, and attitude, were asked in a different format because these factors regard the alternatives. For feasibility, respondents were asked how hard it would be to use an alternative mode of transportation once a week instead of the car on a scale of 1 (very hard) to 5 (very easy). Respondents were also asked which alternative they prefer and what type of trip they are most likely to change from a car trip to a trip with an alternative. For perceived behavioral control, respondents were asked how hard it is for them to use the four alternatives on a scale of 1 (very hard) to 5 (very easy).

Moreover, questions about four barriers regarding the alternatives were asked via statements, see Table 2 that could be answered on a Likert scale from 1 (completely disagree) to 5 (completely agree). The four barriers, time, comfort, cost, and accessibility are thought to also have an impact on behavior and behavioral change. Finding out what barriers residents encounter, can help to design effective policy measures (Michie et al., 2011). These questions were asked four times for all alternative transportation modes: public transportation, cycling, walking, and shared mobility. These are the alternatives to private car-use targeted by the municipality of Purmerend (Gemeente Purmerend, 2022a).

As mentioned earlier, one of the key factors behind SSBC is 'attitude', specifically towards the alternative choices. Given attitudes have to be measured individually and independently per each alternative, the related survey questions were asked alongside barrier-related questions, which also related exclusively to the alternative modes.

Table 2 Statements about factors and barriers regarding alternatives

Topic	Statement
Attitude	I have a bad overall opinion about [transportation mode]
Time	[transportation mode] takes too long
Cost	[transportation mode] is too expensive
Accessibility	[transportation mode] is not accessible for me (for example due to the availability in the area or lack of good infrastructure)
Comfort	[Transportation mode] is not as comfortable

E-mail

To motivate more people to complete the online survey, a €25 gift card was raffled among respondents. The last part of the survey was a field where people could leave their e-mail address if they wanted to win this gift cart.

3.4 Survey data gathering

The survey was created in Qualtrics survey software and distributed through flyers and posters, see [annex B](#). The flyers were brought door to door and left at local stores. An estimated amount of 1500 flyers were given to households. This number is much lower than the total number of households in the area because many people had 'nee' stickers on their mailboxes. This is a system where people can place a sticker on their mailbox to indicate that they do not want to receive unaddressed mail. These households did not receive the survey flyer. Stacks of flyers were left at a local flower store in Waterlandkwartier, the public library and a community center. The posters were put up on public poster walls, see [annex B](#). The flyers and posters contained a QR-code which led to the online survey.

3.5 Sample

The sample sizes of other researchers using SSBC range from 100 to 1818 respondents. The average of the 7 studies looked at, is 1019 respondents (Schaffner et al., 2017; Ohnmacht et al., 2018; Wang et al., 2023; Weibel et al., 2019; Hielkema & Lund, 2021; E. Keller et al., 2021; Bamberg, 2013a). One could state that the ideal sample size for this thesis would be around 1000 respondents, because most papers using SSBC have a sample size of around 1000 (Schaffner et al., 2017; Ohnmacht et al., 2018; Hielkema & Lund, 2021; E. Keller et al., 2021; Bamberg 2013b). Most of these studies, however, have a much larger scope than this thesis, e.g. the population of a country (Hielkema & Lund, 2021). Moreover, 1000 respondents is also not a realistic goal. The scope area only has around 2500 households, and due to limits (e.g. time and not having access to e-mail addresses of residents) not all residents could be contacted. A recent survey with a narrow, specific scope, namely Dutch dairy farmers, was performed considering 100 respondents (Wang et al., 2023), and provides a more realistic sample size goal for this study.

The survey received 122 respondents, of which 12 people did not live inside the scope area, and 8 people were younger than 18. Additionally, 17 people did not finish the survey (most only answered the first question). The final total number of respondents is 85. This is lower than the desirable number of respondents of 100. Only 23 respondents were from Waterlandkwartier. Wang et al. (2023) also had a small sample size of 100 in the context of Dutch dairy farmers, and this led to several challenges, including weak associations and inconclusive results because of the reduced ability to find significant effects. Research with larger sample sizes, like Schaffner et al. (2017) and Bamberg (2013a) with a sample size around 1000, did not face these limitations. However, Wang et al. (2023), still managed to identify meaningful trends with a sample size of only 100 respondents, by focusing on the influencing factors. Similarly, despite the small sample, this study captured insights into key motivators for behavioral change by looking into patterns in the data.

To ensure that the sample is representative in terms of sociodemographics for the area, two questions were asked. The first question is about age, and the second question is about household composition. Results showed there are no large differences between the age distribution of the sample and data from the municipality. The age group 24-54 is slightly overrepresented in the data, and the age group 56-74 is slightly underrepresented, see Figure 6.

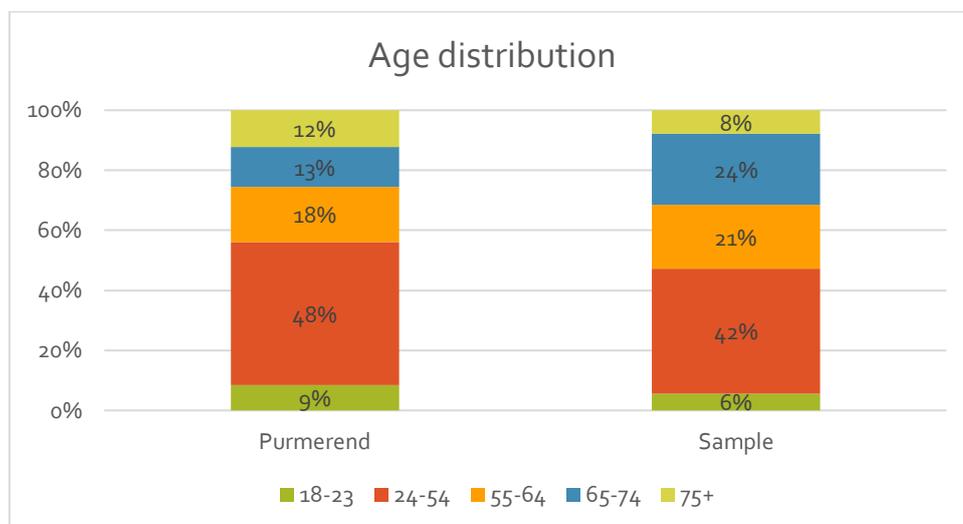


Figure 6 Age distribution Purmerend compared to sample (Gemeente Purmerend, n.d.)

The survey respondents were asked to choose in what type of household they live, the options provided were: single person household, couple without children, couple with children, single parent, multi-generational households, and other. The municipality has no data about multi-generational households, and other households. Therefore, these household types were left out of this comparison. Results show there are no large differences between the sample and the data from the municipality. Couples without children are overrepresented and single parent households, couples with children and single-person households are slightly underrepresented, see Figure 7

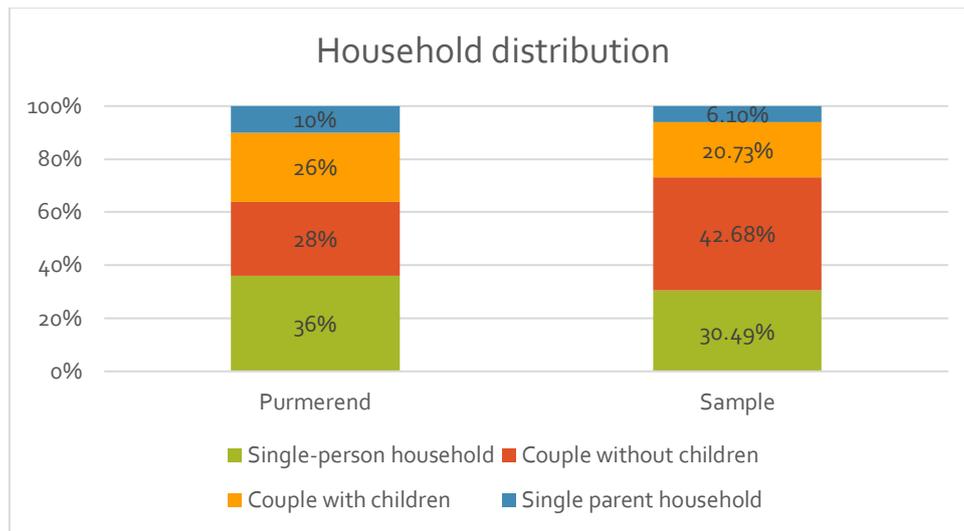


Figure 7 Household distribution Purmerend compared to sample (Gemeente Purmerend, n.d.)

3.6 Survey data analysis

The data from the survey was analyzed through Microsoft Excel. This software was chosen for data analysis because of its accessibility, ease of use, and versatility. Excel's built-in functions, such as formulas, offered the necessary tools for data analysis and visualization. While specialized programs like SPSS or R provide more advanced features, Excel's capabilities were sufficient for the scope of this project, allowing for efficient analysis and clear presentation of results.

Before any data analysis could start, all respondents needed to be allocated to one of the four behavioral change phases. In paragraph [overview SSBC](#), the four different phases are explained. To distribute the respondents, two questions were used. The first question was about intention to change behavior, and the second question was about current car-use. Table 3 shows what the criteria for each phase was in this thesis. Most studies utilizing SSBC rely on a single question to assess the phase of behavioral change. For example, to increase organic food consumption, Richter and Hunecke (2020) inquired about both intention and current behavior within one question. Asking about two different concepts in one question can confuse respondents, leading to ambiguous and unreliable data that complicates analysis and interpretation. To avoid combining two aspects into a single question, this study divided the question into two separate parts, one focusing on intention and the other on current behavior.

Question asked by Richter and Hunecke (2020) to determine phase of behavioral change

Which statement applies most to you?

- Currently, I mostly buy conventionally produced food and do not intend to change this in the future.
- Currently, I am thinking about more frequently buying organically produced food instead of conventionally produced food, but I am not yet sure how I can realize it.
- I intend to buy organically produced food more frequently, and I have already informed myself about how I can realize it.
- I already prefer buying organically produced food as often as possible instead of conventionally produced food, and I intend to maintain this in the future.
- For me, none of the statements applies, as in my household I am not responsible for buying food

(Richter & Hunecke, 2020)

Table 3 Criteria for phases of behavioral change

Phase of behavioral change	Criteria	Exception
Pre-decisional	No intention to change mobility behavior or wants to increase car-use.	If the respondent does not want to change the behavior, and rarely uses a car, they are placed in the post-actional phase.
Pre-actional	Wants to change behavior but does not know how.	
Actional	Wants to change behavior and knows how.	
Post-actional	Has already decreased car-use.	If the respondent still uses the car for most of the trips, they are placed in the actional-phase.

To better understand the relationship between the factors and phases of behavioral change, the data was visualized using percentage stacked column charts. These charts effectively display how the different factors relate to the chance of belonging to a higher phase of behavioral change (e.g. the relationship between the degree of perceived responsibility and phase of behavioral change). The columns were normalized to 100% to make comparisons easier.

Following the visualization, statistical significance was calculated to determine the strength of the observed relationships. A chi-square test was used to assess the relationships between the factors and phase of behavioral change. This test was chosen to compare the observed frequencies with expected frequencies and determine if any differences were statistically significant or due to random chance. A significance level (p-value) of 0.05 was applied. If the p-value was below this threshold, it indicated that the observed relationships were statistically significant, meaning they were unlikely to have occurred by chance. This approach ensured a thorough analysis of the data, allowing for conclusions about the relationships between the factors and phases.

Focus factors

The secondary hypotheses explain that as a factor (e.g. perceived responsibility) is stronger, the chance is higher that the residents are in a higher phase of behavioral change (Bamberg, 2013b). In this thesis, the strength of the factors was measured by how much the respondents of the survey agreed with the statements about the factors. To find the most effective policy measures, factors that scored the lowest (the factors where respondents agreed the least with the statement) were chosen as focus factors for this thesis. These factors have the most room for improvement and

increasing their influence can help individuals to shift to alternative modes of transportation. This was done by calculating the average answers to the questions about the statements. The lower the average, the less the respondents agreed with the statement.

After the factors, data about the four barriers was analyzed per alternative and per neighborhood. The averages of the answers were calculated and visualized in bar diagrams. This made it possible to see if the barrier was more of a problem in a specific neighborhood, or for a particular alternative.

To further analyze the data, to see if there needs to be a focus on a specific group of people, the data about transportation mode use, factors and barriers was analyzed per age group and per household composition. This was done by calculating the average answers of the groups and comparing them to each other.

3.7 Measure analysis

To answer research question 2, a review of policy measures aimed at reducing car-use was conducted. This involved reviewing measures used by other Dutch municipalities and literature. The reviewed municipalities were all front runners in the field of car-reduction, and all located in de Randstad. For this, a rapport by KiM (2023) was used where they analyzed car-use reduction measures used by municipalities in the Netherlands. The results from this report were compared to the aimed measures by the municipality of Purmerend, to see if they missed valuable measures that are utilized by other cities.

Besides the review of policy measures by other municipalities, a review of soft measures based on the focus factors was conducted. The factors that were the weakest have a focus in this research and were looked at more thoroughly. For these factors a review of literature was done to explore policy measure that can be implemented to reduce car-use.

4. Current mobility behavior and influencing factors

The first research question is 'What is the current mobility behavior of the residents of Waterlandkwartier, and what factors influence this behavior?'. This chapter shows the results of the survey about mobility behavior and influencing factors.

4.1 Mobility behavior

The current mobility behavior is assessed first. Data was gathered about how often residents use the car or one of the four alternative modes of transportation: public transportation, cycling, walking and shared mobility. Additionally, data was gathered about what types of trips the different transportation modes are used for. The results are compared for the four different neighborhoods, age groups and different household compositions.

Modality Use

Based on the overall sample data, the car is used most often, see Figure 8. Car-use is consistently on average rated around 3 (used sometimes) across all trip types: commuting, grocery shopping, leisure, and picking up and dropping off children. Public transportation is, especially for commuting and leisure trips often used. This suggests that public transportation is a viable option for these types of trips. It is however rarely used for grocery shopping or child-related trips. Cycling is popular for grocery shopping and leisure, showing that it's a preferred option for shorter or more recreational trips, while it is less frequently chosen for commuting and child-related trips. Walking stands out in grocery shopping, with the highest rating, indicating a strong preference for walking to access essential services nearby, while it is used less often for leisure and even less so for commuting and child-related trips. Lastly, shared mobility options are rated the lowest across all trip types. This form of transportation is almost never used, reflecting minimal integration or use within the sample, regardless of the type of trip. This distribution highlights that while cars are a common choice across activities, sustainable modes like walking and biking are favored for certain types of trips. See [annex C](#) for descriptives.

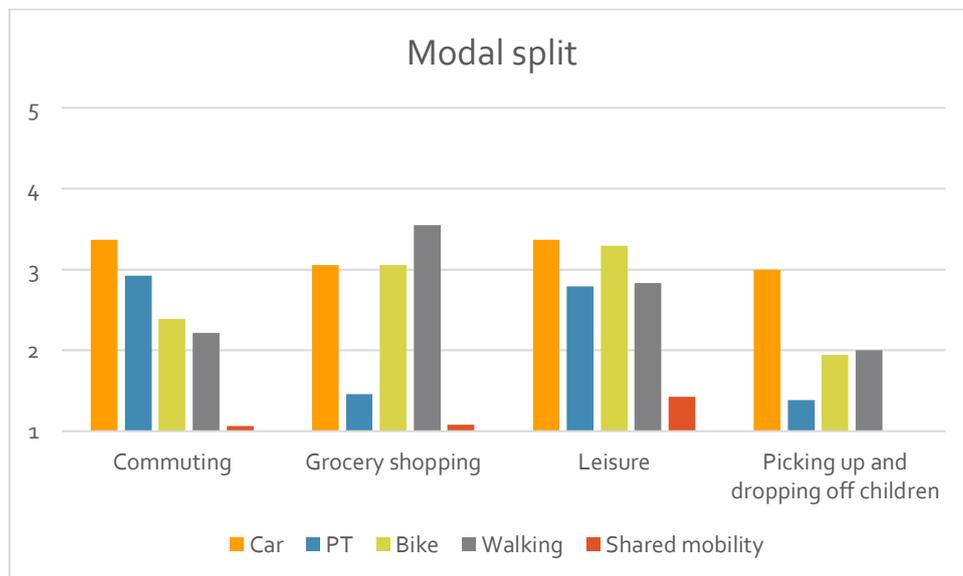


Figure 8 Average response on how often different modes are used for different trips (1= never, 5=always)

In Waterlandkwartier, car-use is dominant for all trip types, with residents frequently choosing this mode. Public transportation is not used very often by the respondents, it is used most often for leisure. Walking and biking are both moderately used for different purposes, showing a tendency towards these modes for grocery shopping and leisure activities. Shared mobility options are the least utilized overall, it is almost never used.

Comparing the four neighborhoods, car-use is high for commuting and leisure across all areas, with Waterlandkwartier showing the highest car-use for nearly all trip types. Stationsbuurt stands out for its significant reliance on bikes, particularly for commuting and grocery shopping, while Centrum and Wagenweggebied stand out for walking for groceries, showcasing the close proximity to amenities in these neighborhoods. Wagenweggebied is unique for its high use of public transportation for commuting, contrasting with the moderate to low public transportation use in other neighborhoods. Across all neighborhoods, shared mobility remains the least preferred mode, see Figure 9.

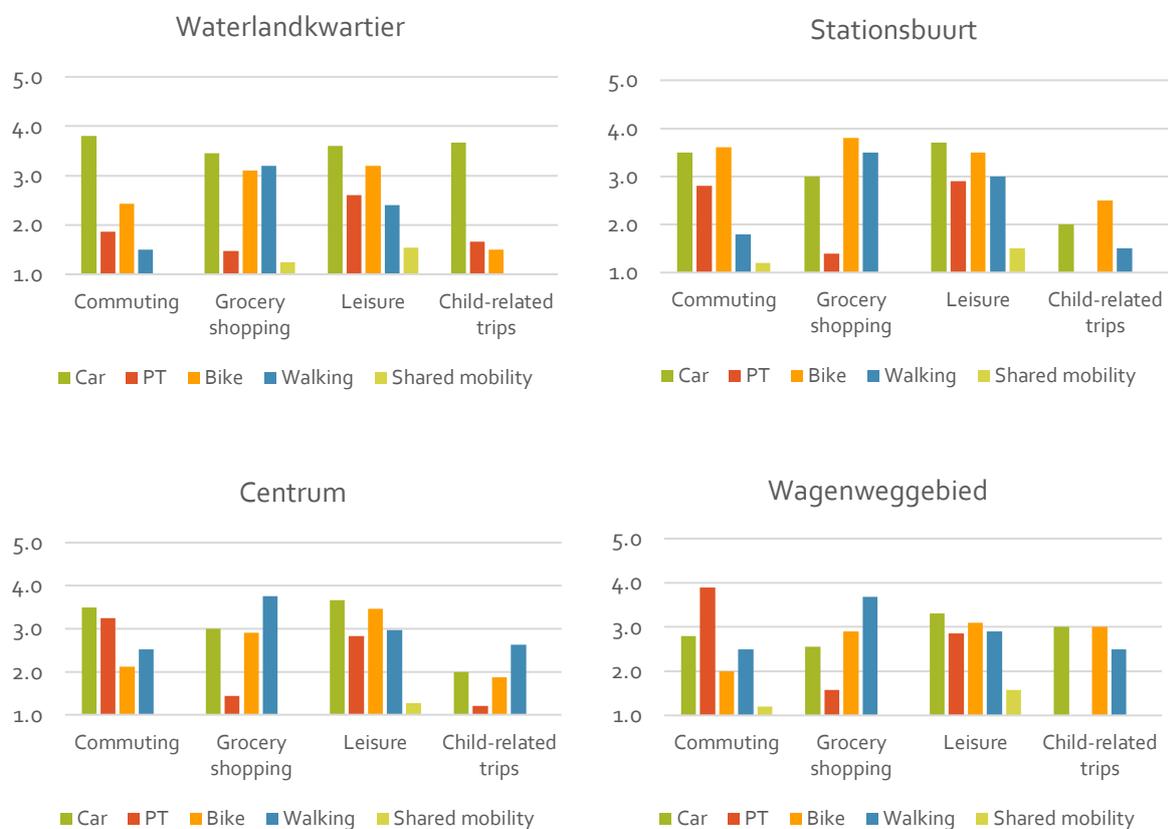


Figure 9 Average response on how often different modes are used for different trips in different neighborhoods (1= never, 5=always)

Phase distribution

When using SSBC as a framework, it is crucial to determine in which phase of behavioral change people are. Phase of behavioral change is based on a person's current car-use and their intention to change their behavior. The data on the distribution of phase of behavioral change reveals variations across the four neighborhoods. Overall, the majority of respondents are in either the first phase (pre-decision) or the last phase (post-action), with 35 people in pre-decision and 34 in post-action, see Table 4. This indicates that while many residents have not yet considered reducing car-use, a significant portion has already implemented changes and maintained them. Not many residents currently consider changing their behavior, or are planning to change their behavior, with 14 people in the actional phase and only 2 people in the pre-actional phase.

In Waterlandkwartier, the majority of residents are in the pre-decisional phase of behavioral change, reflecting the neighborhood's strong reliance on cars. Stationsbuurt has a smaller number of residents in the pre-decisional phase, with a few actively reducing their car-use and others who have already made changes. In Centrum, the largest number of residents are in the post-actional phase, indicating a strong commitment to reducing car-use. Wagenweggebied presents a balance with residents in the pre-decisional and post-actional phase.

Table 4 Phase distribution per neighborhood

	Pre-decisional	Pre-actional	Actional	Post-actional
Total	35	2	14	34
Waterlandkwartier	10	2	5	4
Stationsbuurt	4	0	3	2
Centrum	13	0	5	21
Wagenweggebied	8	0	1	7

4.2 Influencing factors

SSBC identifies several factors that influence behavior and could help to find fitting policy measures to reduce car-use. Factors used in this thesis are: negative emotions towards car-use, perceived responsibility, problem awareness regarding car-use, social norm, personal norm, attitude towards alternative modes of transportation, feasibility of using alternatives, and perceived behavioral control over the alternatives (Bamberg, 2013b). This paragraph explains how the residents in different neighborhoods, age groups and household types view car-use and the use of alternative transportation modes.

Figure 10 provides insights into eight factors influencing car-use. On average, respondents demonstrated medium to high levels of negative emotions (3.5), perceived responsibility (3.4), and problem awareness (3.3), indicating an awareness of the potential downsides of car-use, and the role they play in the matter. However, social norms (2.7) are relatively low, suggesting that reducing car-use may not yet be widely supported within the respondents' community. Personal norms (3.2) show moderate individual motivation towards change. The attitude (3.8), perceived feasibility (3.9), and perceived behavioral control (3.9) regarding the alternative modes of transportation is high. This suggests a generally positive view of more sustainable alternative transportation options.

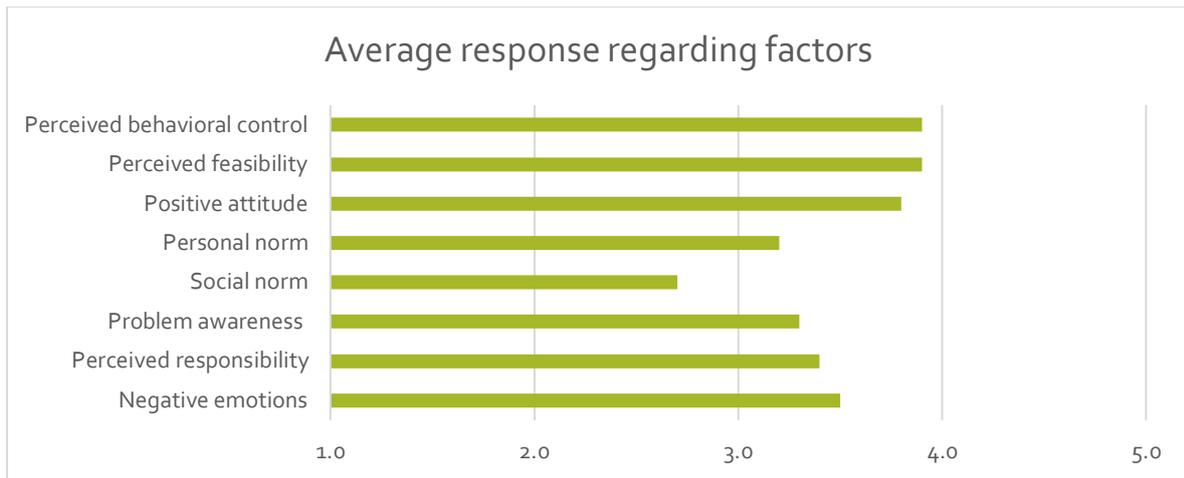


Figure 10 Average response regarding factors (1= factor is weak, 5= factor is strong)

Factors per neighborhood

Examining the neighborhoods, Stationsbuurt has higher scores for perceived responsibility (3.8) and problem awareness (3.5), meaning that they have a stronger sense of accountability and recognition of problems associated with car-use. Additionally, social norms are higher here (3.1), suggesting a slightly stronger community expectation to reduce car-use compared to other areas. In contrast, Waterlandkwartier has the lowest score in social norms (2.2), indicating that car-use reduction may not be as socially encouraged or valued.

Both Wagenweggebied and Stationsbuurt display strong positive attitudes towards alternatives (4.0), suggesting that residents in these areas view non-car transportation modes favorably. Stationsbuurt has a slightly lower score in perceived feasibility (3.3), suggesting that while residents are open to alternatives, there may be concerns about practical implementation. In Centrum, high scores in personal norms (3.3) and social norms (2.9) suggest both individual and community-level motivations towards sustainable behavior, which may support broader acceptance of alternative transportation options. See [Annex D](#) for descriptives.

Factors per age-group

The data separated per age group reveals differences across the groups in attitudes and perceptions towards car-use and alternative transportation. The 26-30 age group stands out for having low perceived responsibility, social norms, and personal norms, despite high problem awareness and positive attitudes towards alternatives, indicating a gap between awareness and action. Conversely, older age groups, particularly 51-60 and 71-80, show stronger personal norms, higher perceived feasibility, and also positive attitudes towards alternatives, suggesting greater openness to adopting alternative transportation. Younger individuals (18-25) feel the strongest social norms to reduce car-use, while the 41-50 group reports the highest perceived feasibility for adopting alternatives. Overall, older age groups appear slightly more willing and able to transition to alternative transportation than younger age groups.

Factors per household type

The data highlights that across household types there are also some differences. Single parents show high perceived responsibility (4.0) but low personal norms (1.7) and social norms (2.3), suggesting that while they feel responsible for their actions, they lack internal motivation and community support to reduce car-use. This might be due to the challenges of alternative modes of transportation for single parents. Multi-generational households exhibit the highest negative emotions toward car-use (4.0), but their problem awareness (1.5) and social norms (2.0) are low, indicating that emotional concerns aren't leading to action or a clear understanding of the issues. Single person households and couples without children display moderate problem awareness and personal norms, reflecting a balanced approach to car-use and the potential for using alternative modes, though they may not feel strong pressure to do so.

Couples with children score highly on perceived feasibility (3.9) and behavioral control (4.0), showing they feel confident in their ability to switch to more alternative modes of transportation, even though their social norms are moderate (2.5). People that live with housemates have very positive attitudes toward alternatives (4.8), yet their lower behavioral control (3.0) suggests that despite their openness, they may face practical barriers in using the alternatives.

4.3 Barriers to alternatives

Besides the factors, data was gathered regarding the different alternatives. This makes it possible to identify barriers for using specific alternatives, see Figure 11.

The data reveals notable differences in perceived barriers for each transportation mode. For public transportation, the cost of using public transportation scores relatively high (3.9), indicating that it is seen as a significant barrier for many. Besides the cost, time (3.6) is also seen as a strong barrier. Comfort (3.3) poses as a moderate barrier suggesting that the duration of trips and the level of comfort while traveling are concerns for users. Accessibility (1.7) and perceived behavioral control (2.0) are perceived as minor barriers, implying that most people feel PT is easy to access and that they are capable of using it.

When it comes to cycling, the barriers are considerably lower. Cycling does not seem to have any strong barriers for the resident. Time (2.7), attitude and comfort (2.4) are relatively low barriers, showing that for most people, cycling is not too time-consuming or uncomfortable. Cost (1.5) is the least significant barrier, reinforcing the fact that cycling is viewed as an affordable option. Accessibility (1.9), attitude (1.7) and perceived behavioral control (1.7) are also low, meaning people feel capable of cycling, think positively about the bike and have access to one.

Walking is the transportation mode with the least perceived barriers. Time (3.2) is slightly more of a concern than with cycling, but still moderate, and expected when walking. Cost (1.3), comfort (2.4), attitude (1.6) and perceived behavioral control (1.6) are seen as insignificant to minor barriers.

Shared mobility scores the highest for perceived barriers. Almost all barriers are considered to be moderate barriers. Perceived behavioral control is much higher for shared mobility compared to the other alternatives (3.6), suggesting that residents feel they have less capability to use these services. Shared mobility also has the highest score for attitude (2.9) out of all the alternatives, meaning that residents feel the least positive towards this alternative. See [annex E](#) for descriptives.

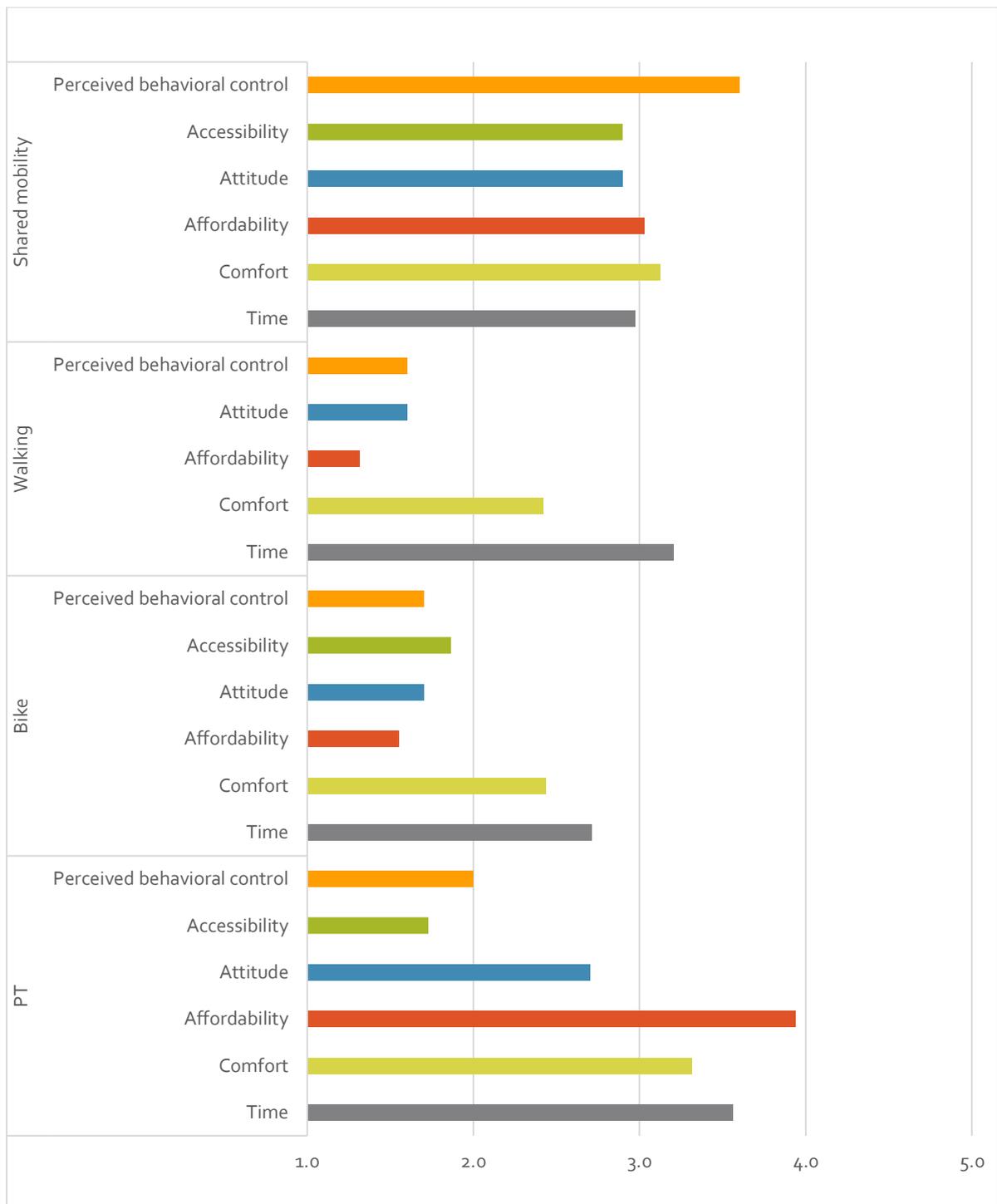


Figure 11 Average response to barriers per alternative (1=Barrier is insignificant, 5= Barrier is significant)

Barriers per neighborhood

When the data is analyzed per neighborhood, there are not many notable differences between the four neighborhoods. There are some small differences, but generally, when something is perceived as a barrier, it is perceived as a barrier in all neighborhoods. Some differences are in Stationsbuurt face higher financial barriers for public transportation (4.4) than the residents in the other neighborhoods. In Wagenweggebied, the attitude barrier to cycling is lower (1.2) than in the other neighborhoods. For shared mobility however, Wagenweggebied faces higher barriers than the other neighborhoods, especially for cost (3.3) and accessibility (4.3). This might be due to the lower availability of shared mobility in this neighborhood.

Barriers per age group

The view of transportation barriers across different age groups reveals that perceptions and challenges differ per age group, reflecting the lifestyles and mobility demands of each demographic group. Residents in their forties and fifties consistently report the highest levels of barriers across all alternative modes of transportation.

Young adults, particularly those in their late teens to early twenties, view higher barriers to cycling. In contrast, older adults, especially those beyond retirement age, report fewer barriers in modes like walking and cycling, which could be attributed to their possibly more flexible schedules and lower speed requirements, allowing them to navigate these barriers more comfortably. However, shared mobility presents a larger challenge for the eldest residents, especially perceived behavioral control, possibly highlighting issues such as technological barriers, and a lack of familiarity with new mobility options.

Interestingly, the youngest and oldest age groups perceive fewer barriers in public transportation compared to their middle-aged counterparts.

Barriers per household composition

When the data is analyzed per household type, there are some differences visible. Single Parents experience high barriers in using most alternative transportation modes. Notably, they face barriers with public transportation in terms of time and cost, suggesting difficulties in balancing efficient transportation with childcare responsibilities. People living with housemates show the highest barriers for public transportation and cycling concerning time and cost. This could reflect a need for more flexible and efficient transportation options. Multi-generational households face the most significant barriers overall, particularly in walking and shared mobility. The high barriers in all modes likely stem from accommodating the different mobility needs of both older adults and younger family members. Couples with children and couples without children show similar barriers in transportation, with a slight difference in public transportation, where couples with children perceive greater difficulties, possibly due to the challenges of traveling with kids. Both groups, however, find cycling and walking reasonably accessible. The cost of public transportation remains a barrier for all groups. People in single person households generally perceive fewer barriers in cycling and walking, suggesting these modes are well-suited to their smaller households. Nonetheless, single person households face noticeable barriers in public transportation costs.

Feasibility

Respondents were asked which alternative they would choose if they had to exchange one car trip per week for a trip with another transportation mode, and what type of trip this would be. After this, they were asked how feasible they think this would be. The results show that most respondents would exchange a car trip for a trip by bike or public transportation, no one chose shared mobility, see Table 5. The respondents that chose the bike as their preferred alternative, mostly chose leisure and grocery shopping as the trip types they would do with the alternative mode. Respondents that chose public transportation as their preferred alternative, mostly chose commuting, grocery shopping and leisure as their preferred trip to do with the chosen alternative, see Table 6. Figure 12 shows the five most popular alternatives and trip types and how feasible the respondents perceive this exchange to be. All trip types are seen as moderate or high, meaning that respondents think it is feasible to exchange one car trip per week for a trip with an alternative mode of transportation.

Table 5 number of respondents per preferred alternative to the private car

Preferred alternative	Number of respondents
N.A.	18
Other	3
PT	21
Bike	34
Walking	4

Table 6 Number of respondents per preferred alternative and trip type

Trip type	Preferred alternative: bike	Preferred alternative: PT
Other	3	1
Commuting	4	8
Leisure	16	6
Groceries	9	5
Child-related trips	2	1

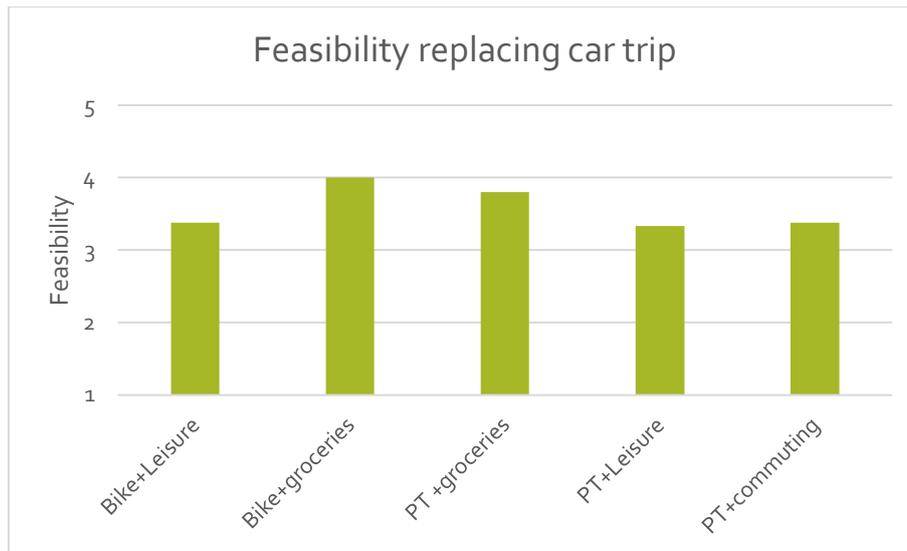


Figure 12 Perceived feasibility of exchanging a type of car trip with an alternative

4.4 Factors and their influence on phase of behavioral change

The SSBC identifies factors that influence the phases of behavioral change. The hypotheses suggest that the stronger or more pronounced these factors—such as negative emotions toward car-use, awareness of responsibility, recognition of problems with car-use, and the strength of social and personal norms—the more likely an individual is to advance to a higher phase of behavioral change. This study tests these relationships by examining how these factors correlate with progression through the behavioral change phases. Chi-square tests were conducted to determine statistical significance, with detailed results available in [annex F](#). This section discusses whether the different factors asked about in the survey have a relation with the phase of behavioral change. The factors that have the strongest relation with phase of behavioral change, also have the biggest influence on changing behavior and can help to design and choose policy measures to reduce car-use.

Negative emotions

The hypothesis regarding negative emotions is 'The more negative the emotional responses towards car-use, the higher the probability of belonging to a higher phase of behavioral change.'. Figure 13 only shows a visible relation between negative emotions and phase 4. It is visible that the higher the negative emotions are, the higher the chance is that people belong to phase four. Because of the low number of respondents in phase 2 and 3, it is not possible to draw any conclusions regarding these two phases. For the pre-decisional phase, there is no clear relation with negative emotions. Because of the unclear relationship, the hypothesis cannot be accepted.

A Chi² test was performed between Negative emotions and phase of behavioral change. There was a statistically significant relationship found between Negative emotions and Phases, $p = 0,004$.

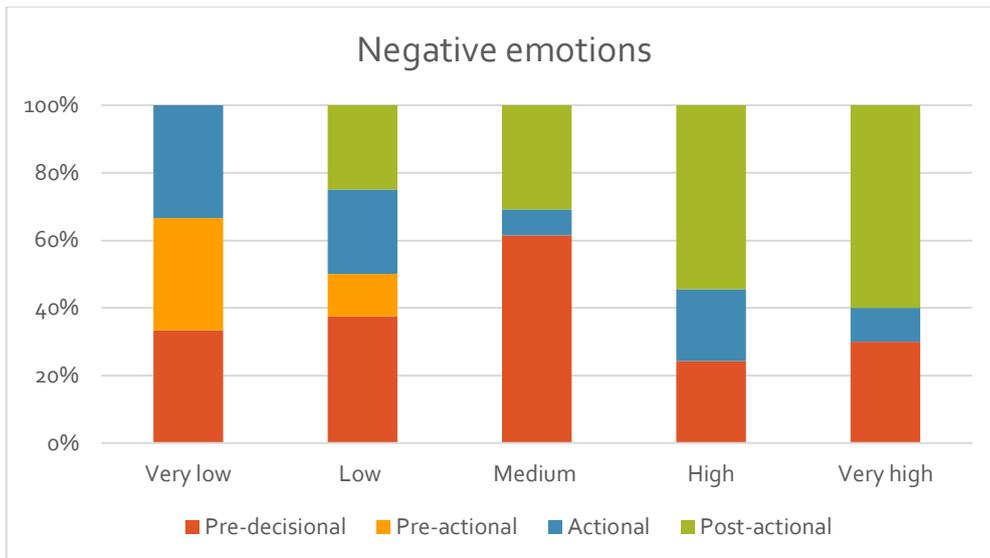


Figure 13 Relation negative emotions and percentage of respondents per phase of behavioral change

Perceived responsibility

The hypothesis for perceived responsibility is: 'The more aware the respondent is of their own responsibility regarding the effects of car-use, the higher the probability of belonging to a higher phase.'. Figure 14 shows a slight relation between awareness of responsibility and phase 1 and 4.

A Chi² test was performed between Responsibility and Phases. There was no statistically significant relationship between Responsibility and Phases, $p = 0,209$. Because of this, the hypothesis cannot be accepted.

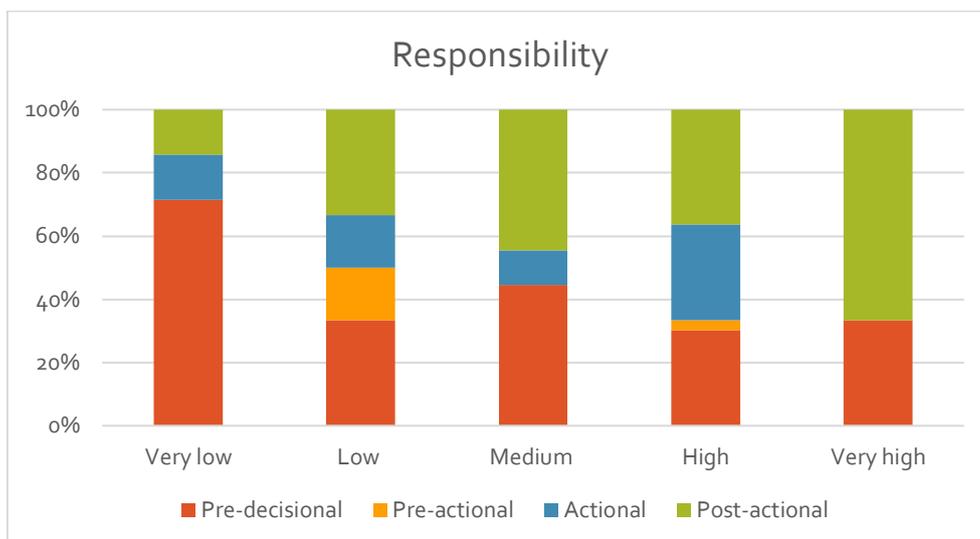


Figure 14 Relation perceived responsibility and percentage of respondents per phase of behavioral change

Problem awareness

The hypothesis for this factor is: 'The more aware the respondent is of problems associated with car usage, the higher the probability of belonging to a higher phase of behavioral change'. Figure 15 shows that there is no strong relation between problem awareness and phase of behavioral change. As problem awareness increases, there is no visible increase in higher phases of behavioral change.

A Chi² test was performed between Problem awareness and Phases. There was no statistically significant relationship between Problem awareness and Phases, $p = 0,976$. Because of this, the hypothesis cannot be accepted.

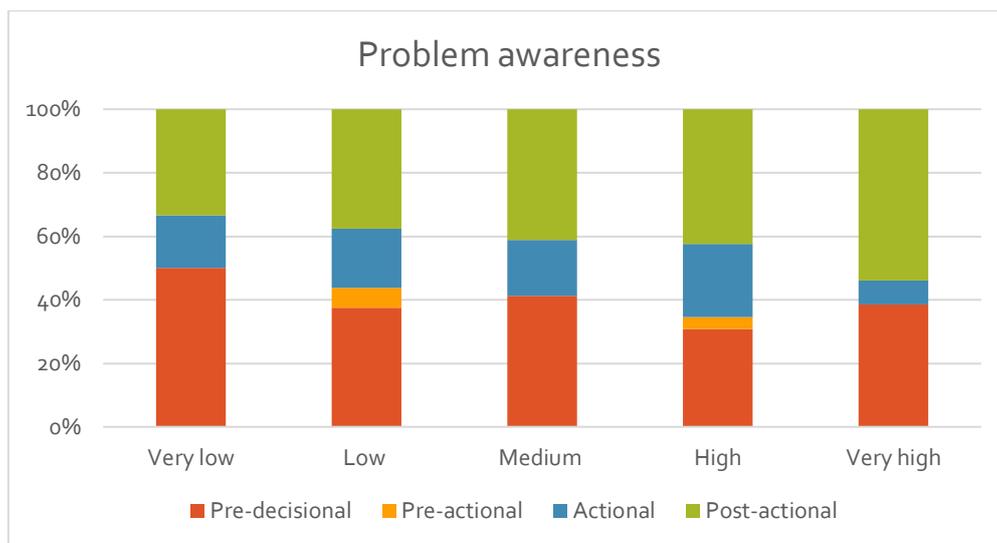


Figure 15 Relation problem awareness and percentage of respondents per phase of behavioral change

Social norm

The hypothesis for this factor is: 'The stronger the social norms favoring reducing car-use, the higher the probability of belonging to a higher phase of behavioral change'. Figure 16 shows a clear relation between social norm and phase 1 and 4. As social norms are stronger, there is a higher chance of belonging to phase 4 and a lower chance of belonging to phase 1.

However, a Chi² test was performed between Social norm and Phases and there was no statistically significant relationship, $p = 0,192$. Because of this, the hypothesis cannot be accepted.

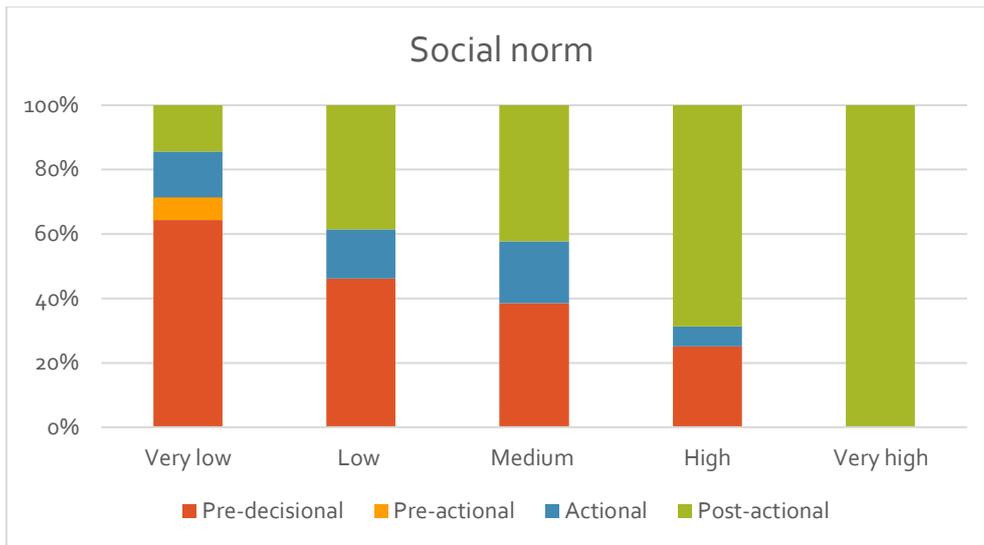


Figure 16 Relation social norm and percentage of respondents per phase of behavioral change

Personal norm

The hypothesis for personal norm is: 'The stronger the personal norms regarding the use of sustainable transportation, the higher the probability of belonging to a higher phase of behavioral change.' Figure 17 shows a slight relation between phase 1 and personal norm. As personal norms regarding reducing car-use increase, the change of belonging to the pre-decisional phase decreases. There is however no clear relation between Personal norm and phase 4.

A Chi² test was performed between Personal Norm and Phases. There was no statistically significant relationship between Personal Norm and Phases, $p = 0,095$. Because of this, the hypothesis cannot be accepted.

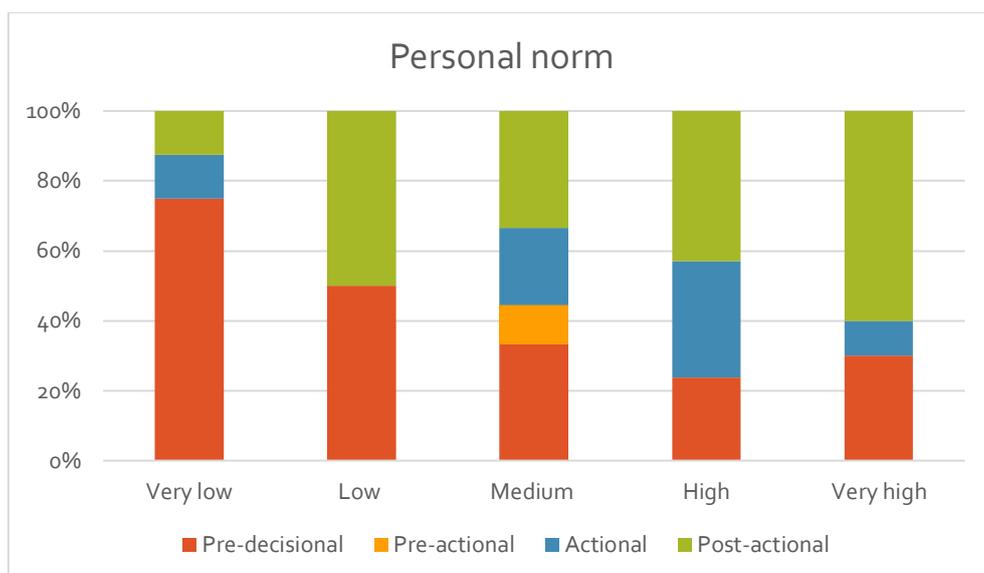


Figure 17 Relation personal norm and percentage of respondents per phase of behavioral change

Attitude

The hypothesis for this factor is: 'The more positive the attitude towards alternative modes of transportation, the higher the probability of belonging to a higher phase of behavioral change.'. Figure 18 shows (besides the answer for very negative), a clear relation between attitude and phase 1. As attitude is more negative, the chance is higher that an individual belongs to phase 1.

Chi² test was performed between Negative attitude and Phases. There was no statistically significant relationship between Negative attitude and Phases, $p = 0,27$. Because of this, the hypothesis cannot be accepted.

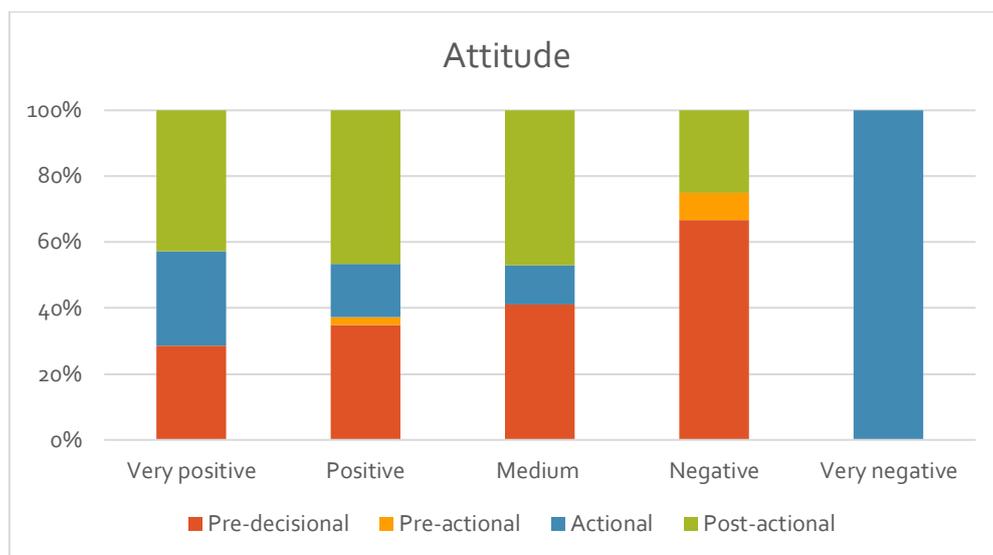


Figure 18 Relation attitude and percentage of respondents per phase of behavioral change (note: this graph goes from positive to negative because the statement about attitude was asked in a different format than the statement for the other factors)

Perceived feasibility

The hypothesis for this factor is: 'The higher the perceived feasibility of using alternative transportation, the higher the probability of belonging to a higher phase of behavioral change.'. Figure 19 shows no clear relation between perceived feasibility and phase of behavioral change.

A Chi² test was performed between *Feasibility* and *Phases*. There was no statistically significant relationship between *Feasibility* and *Phases*, $p = 0,418$. Because of this, the hypothesis cannot be accepted.

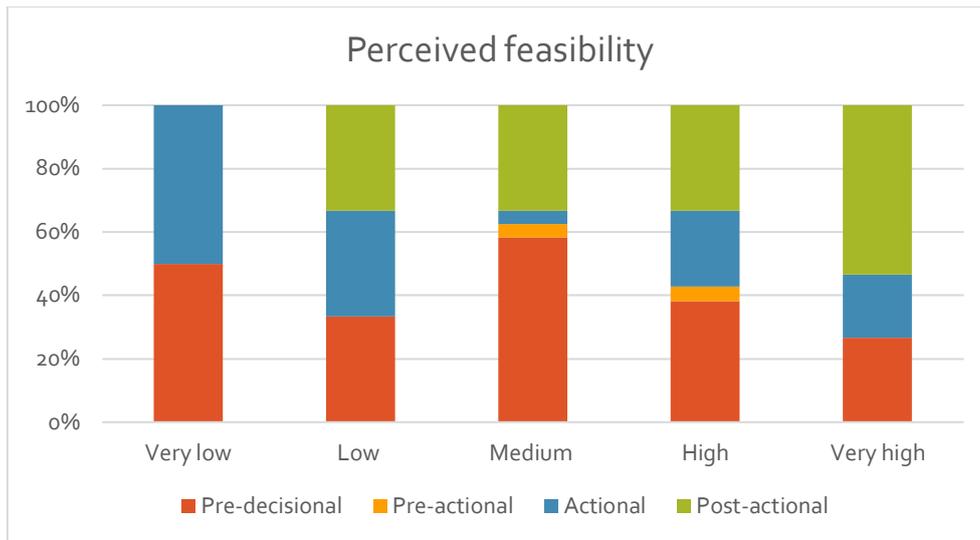


Figure 19 Relation perceived feasibility and percentage of respondents per phase of behavioral change

Perceived behavioral change

The hypothesis for this factor is: 'The higher the perceived behavioral control over using alternative modes of transportation, the higher the probability of belonging to a higher phase of behavioral change.'. Figure 20 shows no clear relation between behavioral control and phase of behavioral change.

A Chi² test was performed between PBC and Phases. There was no statistically significant relationship between PBC and Phases, $p = 0,183$. Because of this, the hypothesis cannot be accepted.

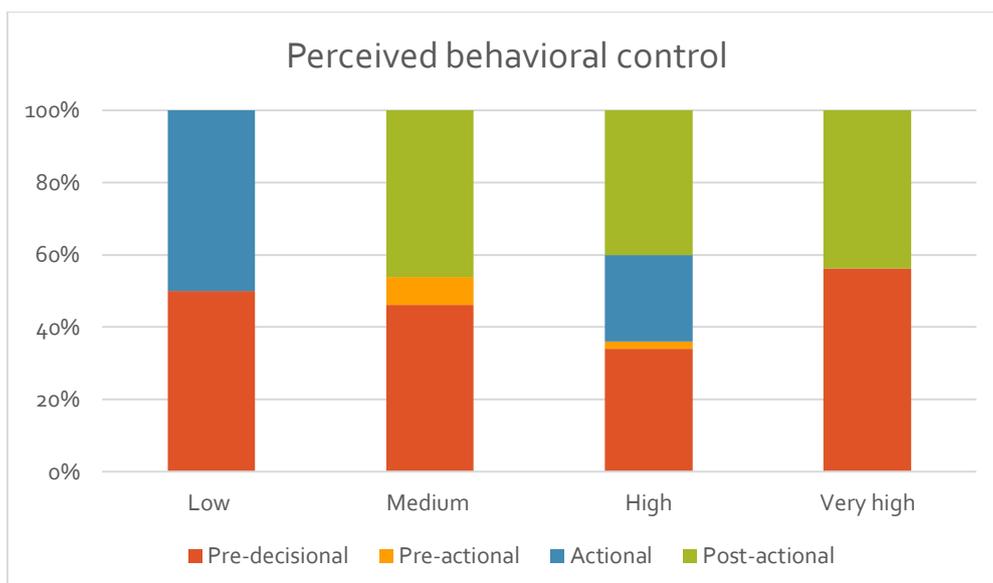


Figure 20 Relation Perceived behavioral control and percentage of respondents per phase of behavioral change

4.5 Concluding current mobility behavior and influencing factors

People in Waterlandkwartier use their car the most for every type of trip. The car is also used a lot in the other three neighborhoods. Most residents from Waterlandkwartier are in the pre-decisional phase, meaning that they use their car a lot and also do not want to change. When looking at all four neighborhoods, most people are in the first and last phase of behavioral change. A very low percentage of respondents is in phase 2. This means that policy measures aimed at reducing car-use should focus on the group of people that are currently in the pre-decisional phase and try to encourage them to change their behavior.

The factors with the lowest scores are social norm and personal norm. Social norms were especially low for residents living in Waterlandkwartier. All other behavioral change factors already have a moderate to strong presence in the neighborhoods. This means that there is room for improvement when it comes to the social and personal norms of people in Waterlandkwartier.

The different alternatives are perceived to have different barriers. Especially public transportation and shared mobility have barriers. For public transportation, cost and time are the largest barriers. For shared mobility, cost, time, comfort, and especially perceived behavioral control are seen as barriers. People across all demographic groups face challenges in using this type of alternative transportation. Shared mobility is also by far used the least out of all alternatives. No respondent chose shared mobility as a feasible alternative for the car. This highlights room for improvement in the barriers faced by people regarding shared mobility.

All secondary hypotheses regarding the factors were rejected. This makes it impossible to determine whether the factors have an influence on behavioral change, and which factors have the largest influence. However, visualized in the graphs, social norms show the clearest relation with phase of behavioral change, suggesting that this factor has the most influence on behavioral change.

5. Car-reduction measures

The second research question, 'What measures can be implemented to reduce car-use among residents in Waterlandkwartier?' is answered in this chapter by analyzing the strategies that the municipality of Purmerend plans to introduce. This analysis includes a comparison with policy measures from other municipalities and considers "soft measures" suggested by the findings from the previous chapter.

5.1 Measures by municipalities

The Dutch Ministry of Infrastructure and Water (KiM) released a document in 2023 where they summarize the low-car policies that Dutch municipalities have implemented and what the goals and effects are of these policies. This document analyzes several Dutch cities in de Randstad (area in the Netherlands where a few large cities are located in close proximity to one another). Purmerend is arguably also located in the Randstad. KiM categorized their policy measures into three categories: adjustments of the built environment, parking measures, and adjusting roads and streets. The measures that are implemented most often by Dutch municipalities in de Randstad are:

- densifying (creating more amenities in close proximity, so people do not need to travel far and can cycle or walk for daily necessities),
- function mix (Creating more different functions in one area, so people can work, live, and find daily necessities in one area and do not need to travel too far),
- lowering the amount of parking spaces,
- lower parking standard in development areas (creating fewer parking spaces per household than is common, to encourage people to not get a (second) car),
- parking permits, introducing and increasing parking fees,
- parking at a distance (making the private car less accessible),
- 'cutting' roads, low-car city center, lowering speed limits, and redesigning roads (making roads and areas less accessible for cars).

It is interesting to note that all policy measures above are hard measures. There is no mention of soft measures or the balance between soft and hard measures. They do however explain that it is important to combine push and pull measures, just like Sørensen et al. (2014), see [paragraph 2.2](#). The Dutch Ministry of Infrastructure and Water (KiM, 2023) explains that implementing pull measures by providing adequate alternative modes of transportation is an important step before implementing push measures to make the private car less attractive.

The municipality of Purmerend already has a vision on how they are designing mobility in Waterlandkwartier. In their document MPvE Waterlandkwartier (Gemeente Purmerend, 2022a), the municipality shows measures aimed at lowering car-use and car ownership. The (envisioned) measures mentioned by the municipality of Purmerend are very similar to the measures taken by other municipalities. Most measures are in line with the three types of measures mentioned by the KiM. Table 7 shows the envisioned measures by the municipality of Purmerend categorized according to the three KiM categories.

Table 7 Measures aimed by the municipality of Purmerend categorized by the KiM categories

Measure	KiM category	Push or pull
Lowering the parking standard	Parking	Push
Creating car-free areas	Adjusting roads and streets	Push
Removing street parking	Parking	Push
Building parking garages (making people walk longer distances to their parked car)	Parking	Push
More amenities at walkable distance	Changing built environment	Pull
Improving sidewalks	Adjusting roads and streets	Pull
Improving bike-lane network	Adjusting roads and streets	Pull

Besides these measures, the municipality also wants to improve shared mobility and public transportation, by placing more shared mobility in prominent places in the city and creating more connections with frequent busses. These are pull measures. The municipality aims to implement both push and pull measures, as is recommended by KiM (2023) and Sørensen et al. (2014). However, the municipality only formulated hard measures, and literature recommends implementing both soft and hard measures (Cairns et al., 2008). Although hard measures can be effective, they are also often expensive and can cause resistance. Because soft measures are based on voluntary change, these measures are often not very expensive and do not cause resistance. Cairns et al. (2008) show that hard measures are most effective when they are implemented alongside soft measures.

5.2 Measures based on previous results and SSBC

In Bamberg's second publication (2013a), he provided types of soft measures per phase of behavioral change, see [chapter 2.4](#). In the [previous chapter](#) it was found that most people are in the pre-decisional phase and the post-actional phase. In Waterlandkwartier, most people are in the pre-decisional phase. For this phase, the most types of measures are recommended by Bamberg. He recommends measures based on enhancing the awareness of the problem, increasing perceived responsibility, making social norms salient, increasing perceived feasibility and promoting the formation of a personal change goal.

Social norm and personal norm measures

In the previous chapter it was found that personal norm and social norm were the factors that scored the lowest in the survey. This means that the residents' own personal norms and values and opinions from their social circles encourage them the least to reduce their car-use. For these two factors there is the most room for improvement. Improving social norm and personal norm with behavioral change measures could encourage the residents to change their behavior (Bamberg, 2013a). Table 8 and Table 9 show measures that can be implemented to improve social norms and personal norms and can encourage a reduction in car-use. The advantages and disadvantages of the measures that were mentioned in the research papers are shown in the table to give a more complete overview of the measures.

Table 8 Measures based on social norm

Measure	Explanation	Pros and cons
Social norms marketing	<p>Spreads factual messages about desirable behaviors among a group. Messages such as: 'The previous guest in this hotel room reused their towel' are proven to be effective in changing behavior. (Miller & Prentice, 2016) (Kormos et al., 2014)</p> <p>In the context of reducing car-use, messages such as '50% of people in this area say that they have already decreased their car-use'.</p>	<p>✓ Can reach many people quickly and cheaply</p> <p>✗ Can only be done when the desired behavior is already common</p>
Personalized normative feedback	<p>Provides individuals with information about their behavior and their peers' behavior. An example targeting environmental conservation, could be providing feedback to people about their energy consumption compared to their neighbors. Participants then receive feedback such as, "You consume more water than 60% of your neighbors" (Miller & Prentice, 2016) (Kormos et al., 2014) (Abrahamse et al., 2007)</p> <p>In the context of reducing car-use, people could be informed about how often they have used their car in the previous week and compare this to the average of the area.</p>	<p>✓ Personalized</p> <p>✗ Labor intensive</p> <p>✗ Privacy sensitive</p>
Focus group discussion	<p>Involves facilitator-led, live interaction groups, which focus on discussing misperceptions and their causes and consequences. (Miller & Prentice, 2016)</p> <p>In the context of reducing car-use, people could talk about the experiences of people that have already decreased their car-use.</p>	<p>✓ Participants are likely to believe the information</p> <p>✗ Labor intensive</p>

Table 9 Measures based on personal norm

Measure	Explanation	Pros and cons
Personalized feedback	<p>Providing feedback on performed behavior. (Steg & Vlek, 2009)</p> <p>In the context of reducing car-use, people could be provided with information about their own car-use, and how this affects the environment.</p>	<p>✗ Labor intensive</p> <p>✗ Privacy sensitive</p>
Antecedent strategies	<p>Raise problem awareness, inform about choice options and inform about consequences of the desired and undesired behavior. (Steg & Vlek, 2009) (Abrahamse et al., 2007)</p> <p>In the context of reducing car-use, messages about the negative consequences of car-use could be spread.</p>	<p>✓ Not labor intensive or expensive</p>
Commitment	<p>Make people promise to change behavior, linked to a specific goal, for example by signing a document</p> <p>In the context of reducing car-use, people could be asked to sign a document that states 'I will try to reduce my car-use in the upcoming month'.</p>	<p>✗ Cannot easily be done at a large scale</p>

Shared mobility

Besides social norm and personal norm being the weakest in the area, it was found that one particular alternative has the most barriers. This alternative is shared mobility. Shared mobility is almost never used in the area, and residents do not have high perceived behavioral control over the modality. There was also no respondent that chose shared mobility as the most feasible alternative of the private car. Improving perceived behavioral control and feasibility of alternatives can encourage people to use the alternatives and reduce their car-use (Bamberg, 2013a). Residents have very little experience with shared mobility, because it is almost never used. This might also be due to the limited availability of shared mobility in Purmerend (Deelmobiliteit.nu, n.d.). With the municipality aiming to improve the availability of shared mobility, measures aimed at increasing perceived behavioral control and feasibility can help to discover the full potential of shared mobility. Table 10 shows measures that can be implemented to improve perceived feasibility. These types of measures should be heavily based on the alternatives to the undesired behavior: car-use. In the case of this thesis, there are four given alternatives: walking, cycling, using public transportation, and using shared mobility. Measures based on increasing perceived feasibility should focus on these four alternatives, but mainly on shared mobility, as residents were most negative about this alternative. The benefit of all measures mentioned below, is that they provide people with experience of using the alternative. This not only increases their perceived feasibility, but also increases peoples perceived behavioral control, because they get the opportunity to learn how to use the alternative.

Table 10 Measures based on perceived feasibility and perceived behavioral control

Measure	Explanation	Pros and cons
Vicarious experience	<p>Providing people with examples of others performing and succeeding in the new behavior, to improve confidence and learn new skills. e.g. providing pictures or videos of people successfully performing the desired behavior. (Warner & French, 2020) (Michie et al., 2013)</p> <p>In the context of reducing car-use, people could be shown footage of others successfully using alternative modes of transportation.</p>	<p>✓ Not labor intensive or expensive</p>
Verbal persuasion	<p>Involves encouragement from others about a person's ability to succeed. Verbal self-persuasion, like positive self-talk or motivational phrases, was found to be effective in boosting job search behaviors and athletic performance. e.g. providing credible sources that state that successful performance is very likely. (Yanar et al., 2009) (Warner & French, 2020) (Michie et al., 2013)</p> <p>In the context of reducing car-use, people could be encouraged to use alternative modes of transportation.</p>	<p>✗ Can cause resistance, if not executed carefully</p> <p>✓ Not labor intensive or expensive</p>
Affective and somatic states	<p>Involves lowering people's apprehension before performing a new behavior. An example could be guided mastery experiences or training of coping, relaxation or stress management strategies. (Warner & French, 2020) (Michie et al., 2013)</p>	<p>✗ Complex</p>
Mastery experience	<p>Providing people with opportunities to experience the new behavior, to convince them of their capabilities of the new behavior. (Warner & French, 2020)</p> <p>In the context of reducing car-use, people could be provided with experience of using alternative modes of transportation by making it free for a short period or organizing</p>	<p>✓ Is seen as most effective perceived feasibility measure</p> <p>✗ Labor intensive</p>

Goal setting

What separates people in the pre-decisional phase, from people in the pre-actional phase, is whether they have formed a personal change goal. Forming a change goal is very important for people to move to a more advanced phase of behavioral change. For some of the measures above, it is mentioned that people first need to have formed a personal change goal, before the measure is effective. Bamberg (2013b) also recommends taking measures based on goal setting when people are in the pre-decisional phase, like most residents of Waterlandkwartier are. Goal setting measures revolve around helping people to form a goal and to help them plan to achieve their goal. Table 11 shows measures that can be taken to encourage goal formation.

Table 11 Measures based on goal setting

Measure	Explanation	Pros and cons
Prompt intention formation	Encouraging people to decide to act or set a general goal, for example, to make a behavioral resolution such as 'I will take more exercise next week'(Abraham & Michie, 2008) In the context of reducing car-use, a resolution such as 'I will reduce my car-use next week' could be used.	✓ Not labor intensive or expensive
Prompt specific goal setting	Involves detailed planning of what the person will do, including a definition of the behavior specifying frequency, intensity, or duration and specification of at least one context, that is, where, when, how, or with whom (Abraham & Michie, 2008) In the context of reducing car-use, people can be encouraged to plan when and how they will use alternative modes of transportation for their upcoming trips.	✗ Labor intensive ✓ Personalized
Prompt review of behavioral goals	Review and/or reconsideration of previously set goals or intentions (Abraham & Michie, 2008).	✗ Requires people to have previous goals

5.3 Concluding car-reducing measures

Measures that can be implemented by the municipality of Purmerend to reduce car-use, are soft measures based on social norm and personal norm, perceived behavioral control and feasibility of shared mobility, and goal setting.

The municipality of Purmerend has already envisioned measures that are comparable to the measures implemented by other municipalities. These include lowering parking standards, creating car-free areas, building parking garages to increase walking distances to parked cars, improving the accessibility of amenities, and improving the alternatives. This measure package has both push and pull measures. However, it only includes hard measures, which, while effective, can be costly and may encounter public resistance. Literature recommends implementing both hard and soft measures Cairns et al. (2008).

The previous results show that social norm and personal norm are the weakest factors in the area. Implementing measures based on these factors can encourage people to change their car-use behavior (Bamberg, 2013a). Besides social norm and personal norm, it was found that the residents have low perceived behavioral control and do not see shared mobility as a very feasible alternative to the private car. Implementing measures based on improving perceived behavioral control and

perceived feasibility of shared mobility can encourage people to use the alternative and reduce their car-use. Additionally, Bamberg (2013a) recommends implementing measures based on forming a personal change goal. Forming a personal change goal is necessary for people to move from the first phase of behavioral change to the second and start changing their behavior.

6. Conclusion and discussion

Cities worldwide are increasingly prioritizing the use of alternative modes of transportation and trying to reduce the use of the private car because the private car has a significant contribution to air pollution and is inefficient in its use of space (Zong et al., 2015). This thesis examined the mobility behavior of residents in Waterlandkwartier, Purmerend, and explored effective measures to encourage a shift from car dependency towards more sustainable transportation options. The study was based on the stage model of self-regulated behavioral change by Bamberg (2013b) and the behavior change wheel by Michie et al. (2011) and focused on behavioral change to understand and influence residents' transportation choices.

High car-usage and no intention to change

In Waterlandkwartier, the car is the dominant mode of transportation for various trip purposes, such as grocery shopping, commuting, leisure, and child-related trips. Residents primarily rely on private cars, with lower usage of alternatives like walking, cycling, public transportation, or shared mobility. Furthermore, survey responses indicate that most residents do not intend to shift away from car use. This aligns with findings of Wiersma et al. (2016), who did research on reducing car dependency in mid-size cities in south Limburg in The Netherlands. Their study revealed that high car dependency in such cities often stems from amenities being located beyond acceptable walking and cycling distances and the inadequacy of alternative transportation options. Similarly, the high car use observed in Waterlandkwartier may also be attributed to the distance of amenities and challenges of alternatives.

This behavior aligns with the stage model of self-regulated behavioral change, which categorizes individuals based on their behavior and intention to change. According to SSBC principles, the majority of residents in Waterlandkwartier fall into the pre-decisional phase. In this phase, individuals are not actively considering to change their behavior. This is what was expected from this neighborhood by the municipality, considering the car-centric character of the environment and the high car use (Gemeente Purmerend, 2022a). When also looking at Stationsbuurt, Centrum and Wagenweggebied, most respondents are classified in either the pre-decisional or post-actional phase, meaning that people are either not at all considering reducing their car-use, or have already reduced their car-use. A very low percentage of respondents is classified in the pre-actional phase or the actional phase, meaning that very few people are currently considering or planning to reduce their car-use. This suggests that the residents might have a simpler binary perception on changing their car-use behavior, either they have or have not changed. These findings highlight the car-centric views of the residents and the need for policy measures to change this.

Hard measures planned by municipality

The municipality of Purmerend has already envisioned measures to lower car-use in Waterlandkwartier (Gemeente Purmerend, 2022a). These measures are comparable to the measures implemented by other municipalities (KiM, 2023). They include lowering parking standards, creating car-free areas, building parking garages to increase walking distances to parked cars, improving the accessibility of amenities, and improving the alternatives. This measure package consists of both push and pull measures. Push measures are aimed at making car-use less attractive and pull measures are aimed at making the alternatives more attractive (Sørensen et al., 2014). Implementing both push and pull measures is recommended by e.g. KiM (2023) and Sørensen et al. (2014).

The mentioned measures, however, are all hard measures. Hard measures are focused on changing external aspects, for example infrastructure or costs. Soft measures on the other hand are measures aimed at changing internal aspects, for example improving people's attitudes. Hard measures, while effective, can be costly and may encounter public resistance. Cairns et al. (2008) recommends implementing both hard and soft measures, because this can increase the speed at which people change their behavior, and this can reduce resistance. This reveals that soft measures are a key area for improvement for the municipality of Purmerend, and other cities currently not implementing soft measures alongside hard measures.

Social norm to foster car-use reduction

Social norm was the factor that the respondents scored to lowest. This survey response showed that the respondents' communities do not encourage them to reduce their car-use. This aligns with research done by Walker et al. (2023), who highlight that social norms often normalize car dependency, making efforts to reduce car-use less socially supported. To reduce car-use, policy measures based on behavior influencing factors should be implemented, according to Bamberg (2013b).

Policy measures that can improve social norms are social norms marketing, personalized feedback and focus group discussions (Miller & Prentice, 2016). Social norms marketing spreads factual messages about desirable group behaviors, to strengthen social norms and foster behavioral change at a large scale (Kormos et al., 2014). Personalized normative feedback provides individuals with tailored comparisons of their behavior to peers, but is labor-intensive and privacy-sensitive (Abrahamse et al., 2007). Focus group discussions involve live interactions where participants share experiences and discuss misperceptions, but they require significant time and resources (Miller & Prentice, 2016). Based on these considerations, it appears that social norms marketing is the most practical and scalable option for car-use reduction.

This aligns with studies such as Lahlou's (2017) as cited in (Yamin et al., 2019), who emphasize the importance of strong social norms in fostering sustainable mobility behaviors. Research by Miller and Prentice (2016) shows that communities with visible norms around sustainable behavior are more likely to encourage individual participation. This shows that improving social norms in the area towards reduced car-use can foster change.

Personal norm to foster car-use reduction

To reduce car use, policy measures based on behavior-influencing factors should be implemented, according to Bamberg (2013b). Personal norms were identified as a key area for improvement, as respondents scored low on statements reflecting their personal commitment to reducing car-use. This indicates that individuals are not strongly motivated by their own norms to decrease their car-use.

Policy measures include personalized feedback, antecedent strategies, and commitment-based interventions. Personalized feedback involves providing individuals with information about their behavior, such as car-use, and its environmental impact. While this is highly personalized, it is labor-intensive and privacy-sensitive. Antecedent strategies aim to raise problem awareness and inform individuals about the consequences of their choices. These strategies are practical, as they are neither labor-intensive nor expensive and can be done at a large scale (Abrahamse et al., 2007). Commitment-based interventions encourage individuals to pledge a specific behavioral change, but these are challenging to implement on a large scale (Steg & Vlek, 2009). Given these options, antecedent strategies appear to be the most practical and scalable for fostering stronger personal norms and encouraging car-use reduction in Waterlandkwartier.

These findings align with Bamberg et al. (2007), who emphasize the critical role of strong personal norms in driving environmentally conscious behavior.

Removing barriers to alternatives

Removing barriers to alternatives can also foster behavioral change (Michie et al., 2011). The results show different barriers to public transportation and shared mobility. For walking and cycling, no interesting barriers could be identified. For public transportation, cost and time are perceived as the largest barriers. This is in line with a study by Buehler and Pucher (2012), who identify cost and time as common barriers to public transportation, particularly in suburban or car-centric areas. The municipality already aims to decrease travel time by creating more connections with frequent busses (Gemeente Purmerend, 2022a). This aligns with Luiu et al. (2018), who emphasize that improving affordability and convenience can significantly enhance public transit adoption.

The survey results identified shared mobility as the least used alternative. This aligns with a research done by Ko et al. (2021) on intention to use shared mobility services. They also found that current shared mobility use is limited. Respondents also did not see shared mobility as a feasible alternative and have low perceived behavioral control, compared to the other alternatives. The lack of perceived behavioral control is likely due to limited experience and the current low availability of shared mobility services in Purmerend (Deelmobiliteit.nu, n.d.). The municipality already aims to improve the availability of shared mobility by increasing the number of shared vehicles in the area (Gemeente Purmerend, 2022a).

Four policy measures that can improve perceived feasibility and perceived behavioral control were identified. These include mastery experience and vicarious experience. Mastery experience involves providing individuals with hands-on opportunities to try shared mobility. This approach has been shown to effectively increase confidence and familiarity with alternative transportation modes. This approach is seen as most effective, but is labor intensive and can be expensive (Warner & French, 2020). Vicarious experience, on the other hand, involves showing people examples of others successfully using shared mobility to build trust and reduce apprehension, this can be implemented at a large scale and is less expensive and labor intensive (Michie et al., 2013). Third is verbal persuasion, this involves encouragement from others about a person's ability to succeed, this measure is not very labor intensive or expensive (Yanar et al., 2009). Lastly is affective and somatic states, this involves lowering people's apprehension before performing a new behavior, this could for example be stress management (Warner & French, 2020). Given these options, mastery experience appears to be the most effective for building confidence in shared mobility and removing the barrier of behavioral control. To reach a larger public, it can be combined with vicarious experience. This aligns with research done by Ko et al. (2021), who found that experience in using shared mobility positively influences the intention to use the alternative.

Personal change goals to foster car-use reduction

Additionally, Bamberg (2013a) recommends implementing measures based on forming a personal change goal. Forming a personal change goal is necessary for people to move from the pre-decisional phase to the pre-actional phase and start changing their behavior. Three policy measures aimed at encouraging people to form a personal change goal were identified by Abraham and Michie (2008): prompt intention formation, prompt specific goal setting, and prompt review of behavioral goals. Prompt intention formation focuses on encouraging individuals to set a general goal. This approach is straightforward, cost-effective, and not labor-intensive, making it suitable for large-scale application. On the other hand, prompt specific goal setting involves detailed planning, where individuals specify how, when, and where they will adopt alternative modes of transportation. While

this method is highly personalized and effective, it requires more resources and effort to implement. Finally, prompt review of behavioral goals entails revisiting and assessing previously set goals, encouraging individuals to reflect on their progress. However, this method is limited to those who have already established behavioral goals, making it less applicable.

Based on these considerations, it appears that prompt intention formation is the best option, as it is cost-effective, easy to implement on a large scale, and encourages individuals to commit to a general goal without requiring intensive resources or planning.

Results show that the different aspects of the stage model of self-regulated behavioral change (Bamberg, 2013b) provided insights into the behavior of respondents in Waterlandkwartier. Even though the results about the influence of different factors on behavioral change were not statistically significant, they still align with key principles of the model. The measures identified as most effective, social norm, personal norm, perceived feasibility, and goal setting, are consistent with those recommended by Bamberg (2013a) for individuals in the pre-decisional phase. Since the majority of respondents are in this phase, these measures could serve as a starting point for reducing car use and encouraging sustainable transportation choices.

Limitations

The primary limitation of this study is the small sample size, which led to minimal representation in the pre-actional and actional phase of behavioral change. This limits the generalizability of the findings and suggests the need for future studies with larger and more diverse samples to capture a fuller spectrum of behavioral phases.

The simplification of complex behavioral factors into single statements, while consistent with methodologies used in similar studies (Wang et al., 2023; Richter and Hunecke, 2020; Hielkema and Lund, 2021), has its limitations. This approach reduces multifaceted factors, such as personal norms, and perceived responsibility, into much simpler concepts. While this allows for streamlined data collection and analysis, it may overlook certain aspects of the factors. Consequently, the findings may miss important subtleties, leading to generalized interpretations. Future studies could benefit from using more detailed measurement methods to capture the broader range of influences and provide deeper insights into the complexity of behavioral change.

Due to time constraints and aiming to keep the survey as short as possible, shared mobility was analyzed as one singular alternative in this research. This approach limits the ability to distinguish between different forms of shared mobility, such as shared cars, and shared bikes, which may have different barriers to users. As a result, the findings may lack specificity in understanding how to tailor measures for each type of shared mobility.

Matching respondents to a phase of behavioral change based on two separate questions about car use and intention to change posed some challenges. This method required creating criteria to assign phases, which had not been done before and proved difficult. While splitting the questions may have made them clearer for respondents, it prevented them from directly choosing the phase that best described them, potentially affecting the phase distribution. To address this, future researchers using the SSBC model are advised to use a single question to determine an individual's phase of behavioral change. This allows respondents to directly select the phase that fits them best. A question similar to the one used by Richter and Hunecke (2020) is recommended.

Future research

Bamberg's (2013b) SSBC model proved to be a valuable theoretical framework for this thesis, as it outlined the cognitive and emotional factors influencing behavioral change. The model was particularly helpful in identifying key factors for individuals in different phases of behavioral change and aligning them with appropriate policy measures to encourage car-use reduction. However, the model's reliance on a larger dataset for more generalized conclusions was a limitation in this study due to the smaller sample size. To address these limitations and enhance the model's utility, future research should replicate this study on a larger scale, such as across an entire municipality or country, with a recommended sample size of 1,000 respondents, similar to Schaffner et al., (2017), Ohnmacht et al., (2018), Hielkema & Lund, (2021), E. Keller et al., (2021), and Bamberg (2013b). Ensuring representation from all phases of behavioral change is crucial for the model's effectiveness. Expanding research to other cities with varied characteristics could further reveal which factors most influence car-use reduction in different contexts. This broader application of the SSBC model could provide actionable insights for cities aiming to implement soft measures alongside hard measures, enabling the development of targeted policy measures to foster car-use reduction.

SSBC was a very helpful and comprehensive framework for identifying emotional and cognitive factors that influence behavior (Bamberg, 2013b). There are however also external factors that can influence behavior. Michie et al.'s (2013) Behavior Change Wheel was a useful addition to SSBC because this model also considers these external factors, such as time and cost. This was helpful in identifying the various barriers to alternatives to private car-use. The BCW facilitated a structured framework for the external factors that influence behavioral change, thereby creating a comprehensive framework combined with SSBC. Future research, using SSBC, is also recommended to include BCW, to ensure the inclusion of external factors.

This thesis found that shared mobility is rarely used and faces barriers. It was treated as a single category, without distinction between its various modes. Future research is recommended to examine the different types of shared mobility individually, analyzing their unique characteristics and identifying the specific factors that influence people to use it as an alternative.

Many of the policy measures discussed in this thesis leave room for interpretation when it comes to their precise implementation. Social norms marketing, for instance, involves spreading messages that emphasize desirable group behaviors to strengthen social norms and encourage large-scale behavioral change (Kormos et al., 2014). However, determining the most effective messaging approach (what to communicate, how to communicate it, and to whom), remains a challenge. Future research should investigate which types of messages resonate most strongly with target audiences and effectively encourage behavioral change. This includes understanding how the framing of messages, the context in which they are delivered, and the methods of communication influence their impact. Such insights would not only make social norms marketing campaigns more targeted and efficient but also simplify the process of implementing these policy measures, ensuring they have the desired effect in promoting sustainable transportation behavior.

7. Recommendations for the municipality of Purmerend

The findings from this thesis can be translated into four practical recommendations for the municipality of Purmerend. By implementing the recommended measures, the municipality can encourage residents to decrease their car-use and use alternative modes of transportation instead.

To strengthen the social norms favoring car-use reduction, the measure social norms marketing is recommended. This is a strategy where messages about desirable behaviors among a group are shared. A message that could be spread is 'almost 50% of people in this area say that they have already decreased their car-use'. This can be done through social media, posters, or other visible methods in public spaces.

Policy measures based on personal norms can increase the residents' personal motivation to decrease their car-use. The recommended measure to improve this is antecedent strategies. This can be raising problem awareness, informing about choice options and informing about consequences of the desired and undesired behavior. Through social media, posters, or other visible methods in public spaces, messages such as 'parked cars take up lots of space in the city that could otherwise be used for greenery and housing' could be communicated.

Shared mobility is seen as an alternative that can reduce car-use and car ownership. The results, however, show that the residents find it much harder to use shared mobility than to use the other three alternatives. The residents also do not find it a very feasible alternative. To encourage people to use shared mobility, it is recommended to implement the measure mastery experience. This means giving people experience in using shared mobility, so their confidence in using it improves. The municipality is already planning on increasing the availability of shared mobility in the area. It is recommended to organize an opening event after the availability is improved. During this event, residents can try the different forms of shared mobility for free. Professionals can explain how to use the shared mobility and answer questions. During the event, photos and videos can be made of the residents using the shared mobility. These can be shared through social media to show other people how shared mobility is used by their peers. This can improve confidence in people that were not present at the event. This is a measure called vicarious experience.

The last recommended measure is called prompt intention formation. This is a measure based on goal setting. Encouraging people to form their own personal change goal can help people to reduce their car use. It is recommended to combine this measure with social norms marketing. The message 'almost 50% of people in this area say that they have already decreased their car use, are you next?' can be spread in the area. This can be done through social media, posters, or other visible methods in public spaces. This shows that people in the community already decreased their car use and encourages people to think about decreasing their own car-use. Combining the two messages also ensures that there are not too many different messages going around.

In conclusion, this thesis presents a framework for encouraging the use of sustainable mobility and reducing car-use. By implementing the recommendations provided, the municipality of Purmerend can influence residents' mobility choices away from the private car. This thesis sets the stage for future initiatives, providing a foundation for Purmerend and other cities to encourage sustainable urban transportation.

8. References

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Annex A: Survey questions

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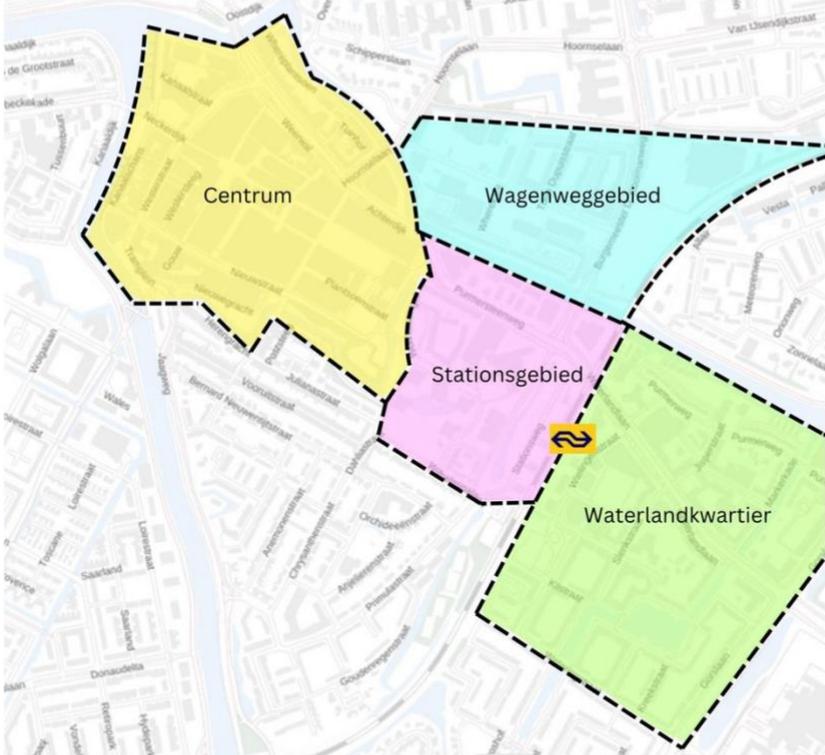
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Demografische gegevens

Q1

Skip to

End of Survey if Ik woon niet in een van de ... Is Selected



Geef aan in welke gebied u woont

- Centrum
- Wagenweggebied
- Stationsbuurt
- Waterlandkwartier (noordelijk deel Gors-Noord)
- Ik woon niet in een van de aangegeven gebieden

Q2

Skip to

End of Survey if Wat is uw leeftijd? Is Less Than 18

Wat is uw leeftijd?

Q3

Hoe ziet uw huishouden eruit?

- Eenpersoonshuishouden
- Stel zonder kinderen
- Stel met kinderen
- Alleenstaande ouder met kinderen
- Multi-generatie huishouden (grootouders, ouders en kinderen)
- Huisgenoten
- Anders

04
Heeft u een rijbewijs?

- Ja
- Nee

05
Heeft u of iemand in uw huishouden, een auto die u kunt gebruiken?

- Ja
- Nee

[Import from library](#) [Add new question](#)

Add Block

Gebruik vervoermiddelen

06
Hoe vaak gebruikt u de **auto** voor de volgende doelen?

(Dit geldt alleen voor ritten met een eigen auto, geen deeltaxi)

	1	2	3	4	5	
	Nooit	Bijna nooit	Soms	Meestal	Altijd	n.v.t.
Reizen naar werk of opleiding						<input type="checkbox"/>
Boodschappen						<input type="checkbox"/>
Vrijtijdsbesteding (sport, hobby, vrienden bezoeken, etc.)						<input type="checkbox"/>
Brengen en ophalen van kinderen						<input type="checkbox"/>

07
Hoe vaak gebruikt u het **openbaar vervoer** voor de volgende doeleinden?

	1	2	3	4	5	
	Nooit	Bijna nooit	Soms	Meestal	Altijd	n.v.t.
Reizen naar werk of opleiding						<input type="checkbox"/>
Boodschappen						<input type="checkbox"/>
Vrijtijdsbesteding (sport, hobby, vrienden bezoeken, etc.)						<input type="checkbox"/>
Brengen en ophalen van kinderen						<input type="checkbox"/>

Q8

Hoe vaak gebruikt u de (elektrische) fiets voor de volgende doeleinden?
(Dit geldt alleen voor ritten met een eigen fiets, geen deelfiets)

1 Nooit Bijna nooit Soms Meestal Altijd n.v.t.

1	2	3	4	5
Reizen naar werk of opleiding				<input type="checkbox"/>
Boodschappen				<input type="checkbox"/>
Vrijtijdsbesteding (sport, hobby, vrienden bezoeken, etc.)				<input type="checkbox"/>
Brengen en ophalen van kinderen				<input type="checkbox"/>

Q9

Hoe vaak loopt u voor de volgende doeleinden?

1 Nooit Bijna nooit Soms Meestal Altijd n.v.t.

1	2	3	4	5
Reizen naar werk of opleiding				<input type="checkbox"/>
Boodschappen				<input type="checkbox"/>
Vrijtijdsbesteding (sport, hobby, vrienden bezoeken, etc.)				<input type="checkbox"/>
Brengen en ophalen van kinderen				<input type="checkbox"/>

Q10

Hoe vaak gebruikt u **deelvervoer** voor de volgende doeleinden?
(Deelvervoer zijn vervoermiddelen die gebruikt kunnen worden door meerdere bestuurders. Denk bijvoorbeeld aan een OV-fiets, Felyx scooter of een deelfiets)

1 Nooit Bijna nooit Soms Meestal Altijd n.v.t.

1	2	3	4	5
Reizen naar werk of opleiding				<input type="checkbox"/>
Boodschappen				<input type="checkbox"/>
Vrijtijdsbesteding (sport, hobby, vrienden bezoeken, etc.)				<input type="checkbox"/>
Brengen en ophalen van kinderen				<input type="checkbox"/>

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Add Block

Fases SSBC

Q11

Welke van de volgende stellingen over autogebruik past het beste bij u?

- Ik wil mijn autogebruik verminderen, maar ik weet niet hoe ik dit kan doen
- Ik wil mijn autogebruik verminderen en weet hoe ik dit kan doen
- Ik heb mijn autogebruik al vermindert
- Ik wil mijn autogebruik niet veranderen
- Ik wil mijn auto meer gaan gebruiken

[Import from library](#) [Add new question](#)

Add Block

Stellingen 55BC

012

Hoeveel bent u het (on)jeens met de volgende stellingen?

	1	2	3	4	5
Ik denk meestal niet na over welk vervoermiddel ik zal gebruiken					<input type="checkbox"/>
Wonen in de stad is minder prettig als er veel auto's gebruikt worden					<input type="checkbox"/>
Mijn eigen vervoerkeuzes hebben een invloed op de leefbaarheid van de stad					<input type="checkbox"/>
(Geparkeerde) auto's nemen te veel ruimte in beslag in de stad					<input type="checkbox"/>
De meeste mensen die ik ken vinden dat auto's minder vaak gebruikt moeten worden					<input type="checkbox"/>
Mijn persoonlijke principes motiveren me om minder gebruik te maken van mijn auto, ongeacht wat anderen doen of vinden					<input type="checkbox"/>
Ik wil mijn auto verder weg van mijn woning parkeren als dit zorgt voor een groenere leefomgeving					<input type="checkbox"/>

Import from library Add new question

Add Block

Barrières voor alternatieven

013

Geef aan hoeveel u het (on)jeens bent met de volgende stellingen over openbaar vervoer ten opzichte van de auto

	1	2	3	4	5
Openbaar vervoer duurt te lang					
Openbaar vervoer is niet zo comfortabel					
Openbaar vervoer is te duur					
Ik heb een slechte algemene mening over openbaar vervoer					
Openbaar vervoer is niet toegankelijk voor mij (bijvoorbeeld door de beschikbaarheid in mijn buurt)					

O14

Geef aan hoeveel u het (on)eens bent met de volgende stellingen over **fietsen** ten opzichte van de auto



	1	2	3	4	5
	Helemaal niet mee eens	Niet mee eens	Niet mee eens/oneens	Mee eens	Helemaal mee eens
Fietsen duurt te lang					
Fietsen is niet zo comfortabel					
Fietsen is te duur					
Ik heb een slechte algemene mening over fietsen					
Fietsen is niet toegankelijk voor mij (bijvoorbeeld door geen beschikking hebben tot een fiets)					

O15

Geef aan hoeveel u het (on)eens bent met de volgende stellingen over **lopen** ten opzichte van de auto



	1	2	3	4	5
	Helemaal niet mee eens	Niet mee eens	Niet mee eens/oneens	Mee eens	Helemaal mee eens
Lopen duurt te lang					
Lopen is niet zo comfortabel					
Lopen is te duur					
Ik heb een slechte algemene mening over lopen					

O16

Geef aan hoeveel u het (on)eens bent met de volgende stellingen over **deelvervoer** ten opzichte van de auto



	1	2	3	4	5
	Helemaal niet mee eens	Niet mee eens	Niet mee eens/oneens	Mee eens	Helemaal mee eens
Deelvervoer duurt te lang					
Deelvervoer is niet zo comfortabel					
Deelvervoer is te duur					
Ik heb een slechte algemene mening over deelvervoer					
Deelvervoer is niet toegankelijk voor mij (bijvoorbeeld door de beschikbaarheid in mijn buurt)					

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[Add new question](#)

[Add Block](#)

▼ PBC

O20

Geef aan hoe makkelijk/moelijk het voor u is om de volgende vervoermiddelen te gebruiken

Denk bij het beantwoorden van deze vraag aan uw eigen fysieke mogelijkheden en uw kennis over hoe het vervoermiddel werkt.

	1	2	3	4	5
	Heel moeilijk	Moelijk	Niet moeilijk/makkelijk	Makkelijk	Heel makkelijk
Auto					
Openbaar vervoer					
Fietsen					
Lopen					
Deelvervoer					

▲

[Import from library](#) [Add new question](#)

Add Block

▼ Haalbaarheid

O17

▼ Skip to

End of Block if **Ik gebruik gebruik niet elk...** is Selected

Stel u voor dat u één autorit per week zou moeten vervangen met een ander vervoermiddel. Welk vervoermiddel zou u kiezen?

Openbaar vervoer
 Fiets
 Lopen
 Deelvervoer
 Anders
 Ik gebruik gebruik niet elke week een auto

O18

Als u één autorit per week zou moeten vervangen met een ander vervoermiddel, wat voor soort autorit zou u kiezen om te vervangen.

Reizen naar werk of opleiding
 Boodschappen
 Vrije tijdsbesteding (denk aan sport, hobby, vrienden bezoeken, etc.)
 Kinderen brengen/ ophalen
 Anders

Page Break

O19

Hoe moeilijk/ makkelijk zou het voor u zijn om één autorit per week te vervangen met een ander vervoermiddel?

	1	2	3	4	5
	Heel moeilijk	Moelijk	Niet moeilijk/makkelijk	Makkelijk	Heel makkelijk

▲

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Add Block

▼ Bol.com bon

O21

Laat hier uw e-mail adres achter als u kans wilt maken op het winnen van een bol.com bon van €25

Ik zal alleen contact met u opnemen als u gewonnen heeft

Nee bedankt

▲

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Add Block

End of Survey

Dankwiel voor het invullen van mijn vragenlijst!

U heeft mij hiermee erg geholpen bij mijn afstudeeronderzoek.

Annex B: Survey distribution flyer and poster



Flyer front



Flyer back



Flyers



Poster on public poster pole

Annex C: Modality use

	Commuting	Grocery shopping	Leisure	Child-related trips
Car	3,4	3,1	3,4	3,0
PT	2,9	1,5	2,8	1,4
Bike	2,4	3,1	3,3	1,9
Walking	2,2	3,5	2,8	2,0
Shared mobility	1,1	1,1	1,4	1,0

Average use of modalities per trip type (1=never, 5=always)

Annex D: Factors per demographic group

	Negative emotions	Perceived responsibility	Problem awareness	Social norm	Personal norm	Positive attitude	Perceived feasibility	Perceived behavioral control
Waterlandkwartier	3,4	3,3	3,1	2,2	3,1	3,7	3,6	3,8
Wagenweggebied	3,5	3,2	3,2	2,6	3,2	4,0	3,6	3,9
Stationsbuurt	3,1	3,8	3,5	3,1	3,1	4,0	3,3	3,9
Centrum	3,6	3,4	3,4	2,9	3,3	3,7	3,6	3,8

Average response to factors per neighborhood (1= factor is weak, 5= factor is strong)

	Negative emotions	Perceived responsibility	Problem awareness	Social norm	Personal norm	Positive attitude	Perceived feasibility	Perceived behavioral control
18-25	3,1	3,0	3,1	3,2	3,0	3,1	3,8	4,1
26-30	3,4	2,2	3,6	1,1	1,3	3,6	1,9	3,9
31-40	3,4	3,7	3,1	2,6	3,3	3,9	3,0	4,1
41-50	3,3	3,5	3,0	2,3	3,0	3,9	4,3	3,5
51-60	3,7	3,4	3,4	2,7	3,5	3,8	3,7	4,1
61-70	3,6	3,5	3,1	2,6	3,4	3,9	3,7	3,9
71-80	3,4	3,2	3,3	2,8	3,1	4,2	3,3	3,6

Average response to factors per age group (1= factor is weak, 5= factor is strong)

	Negative emotions	Perceived responsibility	Problem awareness	Social norm	Personal norm	Positive attitude	Perceived feasibility	Perceived behavioral control
Single parent	2,8	4,0	2,3	2,3	1,7	3,4	4,0	3,8
single person	3,7	3,2	3,5	2,9	3,3	3,6	3,5	3,8
Housemates	3,3	3,3	3,3	3,0	1,5	4,8	3,0	4,0
Multi-generational	4,0	2,0	1,5	2,0	2,5	2,7	4,0	4,0
Couple with children	3,5	3,3	3,3	2,5	3,4	3,9	3,8	4,0
Couple without children	3,4	3,7	3,4	2,7	3,3	3,9	3,4	3,9
Other	3,0	2,7	3,7	2,7	5,0	3,7	5,0	3,4

Average response to factors per household type (1= factor is weak, 5= factor is strong)

Annex E: Barriers per demographic group

Total	PT					Bike					Walking					Shared mobility							
	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	PBC	time	comfort	cost	Attitude	Accessibili PBC			
	3,6	3,3	3,9	2,7	1,7	2,0	2,7	2,4	1,5	1,7	1,9	1,7	3,2	2,4	1,3	1,6	1,6	3,0	3,1	3,0	2,9	2,9	3,6

Average response to barriers per modality (1= weak barrier, 5= strong barrier)

Neighborhood	PT					Bike					Walking					Shared mobility							
	Time	Comfort	Cost	Attitude	Accessibili PBC	Time	Comfort	Cost	Attitude	Accessibili PBC	Time	Comfort	Cost	Attitude	PBC	Time	Comfort	Cost	Attitude	Accessibili PBC			
Centrum	3,6	3,3	3,8	2,7	1,8	1,8	2,7	2,6	1,7	1,9	2,1	2,0	2,8	2,4	1,3	1,6	1,6	2,9	3,1	3,1	3,0	2,9	3,5
Stationsbuurt	3,4	2,7	4,4	2,4	1,3	2,0	2,5	2,0	1,4	1,3	1,5	1,3	3,1	2,5	1,0	1,3	1,3	2,7	3,4	2,9	3,0	2,3	4,3
Waterlandkwartier	3,6	3,7	3,9	2,7	1,9	2,3	2,7	2,4	1,6	1,6	1,9	1,4	3,8	2,6	1,3	1,8	1,5	3,3	3,2	2,8	2,6	2,9	3,5
Wagenweggebied	3,7	3,2	4,0	2,5	2,0	1,7	2,2	1,8	1,5	1,2	2,5	1,3	2,7	1,8	1,5	1,0	1,5	3,7	3,3	4,3	3,0	4,3	4,0

Average response to barriers per modality per neighborhood (1= weak barrier, 5= strong barrier)

Age groups	PT					Bike					Walking					Shared mobility							
	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	PBC	time	comfort	cost	Attitude	Accessibili PBC			
18-25	3,6	3,3	3,6	2,6	1,2	1,8	3,3	3,1	1,4	2,4	2,4	1,8	2,9	2,3	1,0	1,3	1,1	3,1	3,3	3,4	3,1	3,1	3,5
26-30	4,2	3,9	4,0	3,4	1,3	2,0	2,6	2,6	1,8	1,6	2,3	1,8	4,0	2,3	1,9	2,1	1,6	2,7	2,9	3,3	2,6	3,1	3,8
31-40	3,8	3,3	4,4	3,4	1,4	1,9	2,2	2,5	1,1	1,4	1,4	1,4	3,1	2,3	1,0	1,6	1,2	2,3	2,8	3,0	3,6	3,0	3,1
41-50	4,0	3,8	4,3	3,5	2,0	2,5	3,0	3,0	1,5	2,0	2,3	2,5	4,0	2,0	1,3	1,8	1,8	4,0	4,0	3,0	4,0	2,3	3,3
51-60	3,0	3,0	4,4	3,0	1,8	1,8	2,4	2,5	1,8	1,4	1,4	1,3	3,3	2,3	1,5	1,4	1,4	3,3	3,1	2,9	3,0	2,7	3,6
61-70	3,5	3,1	3,7	3,4	1,9	1,9	2,8	2,2	1,5	1,6	1,7	1,5	3,3	2,7	1,1	1,6	1,8	3,0	3,1	3,0	3,0	3,0	3,5
71-80	3,0	3,1	3,7	3,6	1,9	2,0	2,6	2,2	1,8	1,6	1,7	1,6	2,7	2,3	1,5	1,5	1,8	3,1	3,3	2,8	3,2	2,4	4,0

Average response to barriers per modality per age group (1= weak barrier, 5= strong barrier)

Household	PT					Bike					Walking					Shared mobility							
	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	Accessibili PBC	time	comfort	cost	Attitude	PBC	time	comfort	cost	Attitude	Accessibili PBC			
Single parent	4,3	3,8	3,8	2,5	2,0	2,0	2,8	2,5	1,3	3,3	1,0	2,3	2,8	1,5	1,0	1,3	1,5	2,8	2,8	2,0	2,8	2,5	3,0
other	3,7	3,7	3,7	3,3	1,0	2,3	2,3	2,3	1,0	1,0	2,3	2,3	3,3	3,0	1,0	2,3	2,0	3,0	3,0	3,0	3,0	3,0	4,0
single person	3,4	3,4	4,3	2,8	1,6	1,9	2,6	2,5	1,5	1,7	1,8	1,7	3,4	2,3	1,2	1,8	1,6	3,1	3,1	3,0	2,7	3,0	3,7
housemates	4,5	2,5	4,5	2,0	1,0	2,0	3,5	3,5	1,5	2,0	2,0	2,0	3,0	2,0	3,0	1,0	1,0	3,0	4,0	2,0	2,0	2,0	3,0
multi generational household	4,3	4,0	4,0	2,7	3,0	2,0	5,0	3,5	1,5	2,5	3,7	2,0	5,0	4,5	1,5	3,0	1,3	4,0	4,3	4,3	4,3	4,0	3,0
couple with children	3,6	3,5	3,9	2,5	1,5	1,9	2,6	2,5	1,9	1,6	1,8	1,6	3,2	2,4	1,2	1,4	1,5	3,0	3,3	3,3	2,7	2,5	3,4
couple without children	3,4	3,0	3,7	2,7	2,0	2,0	2,6	2,2	1,5	1,5	1,8	1,5	3,0	2,5	1,3	1,4	1,6	2,8	3,0	3,0	3,0	2,9	3,7

Average response to barriers per modality per household type (1= weak barrier, 5= strong barrier)

Annex F: Chi-square outputs

Social norm

Observed

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Social norm	Very low	9	1	2	2	14
	Low	6	0	2	5	13
	Medium	10	0	5	11	26
	High	4	0	1	11	16
	Very high	0	0	0	2	2
Total		29	1	10	31	71

Expected

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Social norm	Very low	5.72	0.2	1.97	6.11	14
	Low	5.31	0.18	1.83	5.68	13
	Medium	10.62	0.37	3.66	11.35	26
	High	6.54	0.23	2.25	6.99	16
	Very high	0.82	0.03	0.28	0.87	2
Total		29	1	10	31	71

Chi-square

	Chi ²	df	p
Social norm - Phases	15.98	12	.192

Pearson

	C
Social norm - Phases	0.49

A Chi² test was performed between *Social norm* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Social norm* and *Phases*, $\chi^2(12) = 15.98$, $p = .192$, Cramér's $V = 0.27$

The calculated p-value of .192 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected.

Personal norm

Observed

		Phases				Total
		Phase 1	Phase 3	Phase 4	Phase 2	
Personal Norm	Very low	6	1	1	0	8
	Low	6	0	6	0	12
	Medium	6	4	6	2	18
	High	5	7	9	0	21
	Very high	3	1	6	0	10
Total		26	13	28	2	69

Expected

		Phases				Total
		Phase 1	Phase 3	Phase 4	Phase 2	
Personal Norm	Very low	3.01	1.51	3.25	0.23	8
	Low	4.52	2.26	4.87	0.35	12
	Medium	6.78	3.39	7.3	0.52	18
	High	7.91	3.96	8.52	0.61	21
	Very high	3.77	1.88	4.06	0.29	10
Total		26	13	28	2	69

Chi-square

	Chi ²	df	p
Personal Norm - Phases	18.73	12	.095

Pearson

	C
Personal Norm - Phases	0.53

Summary

A Chi² test was performed between *Personal Norm* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Personal Norm* and *Phases*, $\chi^2(12) = 18.73$, $p = .095$, Cramér's $V = 0.3$

The calculated p-value of .095 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected

Negative emotions

Observed

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Negative emotions	Very low	1	1	1	0	3
	Low	3	1	2	2	8
	Medium	16	0	2	8	26
	High	8	0	7	18	33
	Very high	3	0	1	6	10
Total		31	2	13	34	80

Expected

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Negative emotions	Very low	1.16	0.08	0.49	1.27	3
	Low	3.1	0.2	1.3	3.4	8
	Medium	10.07	0.65	4.22	11.05	26
	High	12.79	0.83	5.36	14.03	33
	Very high	3.88	0.25	1.63	4.25	10
Total		31	2	13	34	80

Chi-square

	Chi ²	df	p
Negative emotions - Phases	29.2	12	.004

Pearson

	C
Negative emotions - Phases	0.6

Summary

A Chi² test was performed between *Negative emotions* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was a statistically significant relationship between *Negative emotions* and *Phases*, $\chi^2(12) = 29.2$, $p = .004$, Cramér's $V = 0.35$

The calculated p-value of .004 was lower than the defined significance level of 5%. The Chi² test was therefore significant and the null hypothesis was rejected .

Responsibility

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Responsibility	High	10	1	10	12	33
	Low	2	1	1	2	6
	Medium	8	0	2	8	18
	Very high	3	0	0	6	9
	Very low	5	0	1	1	7
Total		28	2	14	29	73

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Responsibility	High	12.66	0.9	6.33	13.11	33
	Low	2.3	0.16	1.15	2.38	6
	Medium	6.9	0.49	3.45	7.15	18

Very high	3.45	0.25	1.73	3.58	9
Very low	2.68	0.19	1.34	2.78	7
Total	28	2	14	29	73

	Chi ²	df	p
Responsibility - Phases	15.63	12	.209

	C
Responsibility - Phases	0.48

Summary

A Chi² test was performed between *Responsibility* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Responsibility* and *Phases*, $\chi^2(12) = 15.63$, $p = .209$, Cramér's $V = 0.27$

The calculated p-value of .209 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected.

Problem awareness

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Problem awareness	High	8	1	6	11	26
	Low	6	1	3	6	16
	Medium	7	0	3	7	17
	Very high	5	0	1	7	13
	Very Low	3	0	1	2	6
Total		29	2	14	33	78

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Problem awareness	High	9.67	0.67	4.67	11	26
	Low	5.95	0.41	2.87	6.77	16

Medium	6.32	0.44	3.05	7.19	17
Very high	4.83	0.33	2.33	5.5	13
Very Low	2.23	0.15	1.08	2.54	6
Total	29	2	14	33	78

	Chi ²	df	p
Problem awareness - Phases	4.34	12	.976

	C
Problem awareness - Phases	0.27

Summary

A Chi² test was performed between *Problem awareness* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Problem awareness* and *Phases*, $\chi^2(12) = 4.34$, $p = .976$, Cramér's $V = 0.14$

The calculated p-value of .976 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected.

PBC

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
PBC	High	17	1	12	20	50
	Low	1	0	1	0	2
	Medium	6	1	0	6	13
	Very High	9	0	0	7	16
Total		33	2	13	33	81

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
PBC	High	20.37	1.23	8.02	20.37	50
	Low	0.81	0.05	0.32	0.81	2

Medium	5.3	0.32	2.09	5.3	13
Very High	6.52	0.4	2.57	6.52	16
Total	33	2	13	33	81

	Chi ²	df	p
PBC - Phases	12.57	9	.183

	C
PBC - Phases	0.42

Summary

A Chi² test was performed between *PBC* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *PBC* and *Phases*, $\chi^2(9) = 12.57$, $p = .183$, Cramér's $V = 0.23$

The calculated p-value of .183 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected.

Bad attitude towards alternatives

		Phases				
		Phase 1	Phase 3	Phase 4	Phase 2	Total
Negative attitude	Very low	2	2	3	0	7
	Low	15	7	20	1	43
	Medium	7	2	8	0	17
	High	8	0	3	1	12
	Very high	0	1	0	0	1
Total		32	12	34	2	80

		Phases				
		Phase 1	Phase 3	Phase 4	Phase 2	Total
Negative attitude	Very low	2.8	1.05	2.98	0.18	7

Low	17.2	6.45	18.27	1.08	43
Medium	6.8	2.55	7.23	0.43	17
High	4.8	1.8	5.1	0.3	12
Very high	0.4	0.15	0.43	0.03	1
Total	32	12	34	2	80

	Chi ²	df	p
Negative attitude - Phases	14.49	12	.27

	C
Negative attitude - Phases	0.45

Summary

A Chi² test was performed between *Negative attitude* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Negative attitude* and *Phases*, $\chi^2(12) = 14.49$, $p = .27$, Cramér's V = 0.25

The calculated p-value of .27 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected

Feasibility

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total
Feasibility	High	8	1	5	7	21
	Low	1	0	1	1	3
	Medium	14	1	1	8	24
	Very high	8	0	6	16	30
	Very low	1	0	1	0	2
Total		32	2	14	32	80

		Phases				
		Phase 1	Phase 2	Phase 3	Phase 4	Total

Feasibility	High	8.4	0.53	3.68	8.4	21
	Low	1.2	0.08	0.53	1.2	3
	Medium	9.6	0.6	4.2	9.6	24
	Very high	12	0.75	5.25	12	30
	Very low	0.8	0.05	0.35	0.8	2
	Total	32	2	14	32	80

	Chi ²	df	p
Feasibility - Phases	12.35	12	.418
	C		
Feasibility - Phases	0.42		

Summary

A Chi² test was performed between *Feasibility* and *Phases*. At least one of the expected cell frequencies was less than 5. Therefore, the assumptions for the Chi² test **were not met**. There was no statistically significant relationship between *Feasibility* and *Phases*, $\chi^2(12) = 12.35$, $p = .418$, Cramér's V = 0.23

The calculated p-value of .418 was above the defined significance level of 5%. The Chi² test was therefore not significant and the null hypothesis was not rejected.