



# Parking in the city: take it or share it?

**Master's thesis for the Spatial Planning programme – Specialization Urban & Regional Mobility  
Nijmegen School of Management – Radboud University**

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July 2021

## Colophon

Document	Master thesis
Programme	Spatial Planning
Specialization	Urban & Regional Mobility
Date of submission	5th July 2021
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Organization	Radboud University Nijmegen
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## Samenvatting

Middelgrote steden in Nederland staan steeds meer onder druk door een groeiende bevolking, een toenemend woningtekort en beperkte ruimte. Steden hebben daardoor te maken met stedelijke verdichting, wat vraagt om slimme en creatieve oplossingen voor het gebruik van schaarse ruimte. Uit onderzoek is gebleken dat deelauto's op lange termijn gemiddeld vier tot tien personenauto's kunnen vervangen (Shaheen, 2007). Dit betekent dat er veel kostbare en schaarse ruimte kan worden bespaard op geparkeerde privé auto's in de stad. Deelmobiliteit wordt daarom door gemeenten gezien als een oplossing voor de problemen omtrent verdichting. Hierdoor zijn er steeds meer gemeenten die parkeerbeleid gebruiken om deelmobiliteit te beïnvloeden in de stad. Door het gebruik van beleidsinterventies wordt getracht de aanwezigheid van deelmobiliteit en het gebruik van beperkte ruimte in stedelijke gebieden te veranderen. Echter, uit de literatuur en de praktijk blijkt dat er nog onvoldoende kennis is over het effect van parkeerbeleid op deelmobiliteit in steden.

Het doel van dit onderzoek is dan ook om inzicht te krijgen in de mate waarin deelmobiliteit wordt beïnvloed door parkeerbeleid in middelgrote steden in Nederland. Bovendien richt dit onderzoek zich specifiek op de casus Arnhem waarvoor aanbevelingen zijn gedaan. Dit alles heeft geleid tot de hoofdvraag: *“In hoeverre kan het parkeerbeleid van middelgrote steden in Nederland de rol van deelmobiliteit in de stad beïnvloeden, en hoe kan dit bijdragen aan de doelstellingen van het parkeerbeleid in Arnhem?”*. Dit is onderzocht aan de hand van meerdere middelgrote steden in Nederland in een bureauonderzoek en meervoudige casusonderzoek. Hier zijn document-analyses voor uitgevoerd en zijn interviews afgenomen met beleidsmedewerkers van gemeenten en aanbieders van deelmobiliteit.

Op basis van het onderzoek kan worden geconcludeerd dat het parkeerbeleid van middelgrote steden in Nederland wel degelijk invloed kan hebben op de rol van deelmobiliteit in de stad. Allereerst heeft het parkeerbeleid invloed op het vestigingsklimaat voor deelmobiliteit. Factoren als ruimtegebruik, verdichting en mobiliteit worden beïnvloed door het parkeerbeleid, met als gevolg een verandering in het reisgedrag van mensen en deelmobiliteit in de stad. Ten tweede kan worden geconcludeerd dat parkeerbeleid een direct effect heeft op de mogelijkheid voor aanbieders van deelmobiliteit om wel of niet deelmobiliteit in een stad aan te bieden. Door gebruik te maken van vergunningen voor deelmobiliteit hebben gemeenten veel invloed op de intrede van deelmobiliteit in hun stad. Tot slot heeft het aanwijzen van vaste locaties voor deelvoertuigen door gemeenten grote invloed op de aanwezigheid en het gebruik van deelmobiliteit. De zichtbaarheid van deelmobiliteit kan immers via *nudging* een belangrijke invloed hebben op het reisgedrag van mensen. De zichtbaarheid van een deelvoertuig hangt immers nauw samen met het gebruik en daarmee de aanwezigheid van deelmobiliteit in stedelijk gebied.

Op basis hiervan is onderzocht met welke aspecten de gemeente Arnhem rekening moet houden bij het opnemen van deelmobiliteit in het parkeerbeleid om de beleidsdoelen te bereiken. Ten eerste moet in het parkeerbeleid rekening worden gehouden met vormen van escapisme die het succes van deelmobiliteit kunnen belemmeren. Daarnaast moet het beleid zich niet alleen richten op commercieel delen, maar ook op particulier delen. Ook transparante communicatie met aanbieders van deelmobiliteit en hun wensen meenemen in het formuleren van beleid is wenselijk. Tot slot is het voor gemeenten van belang een goede balans te vinden tussen enerzijds restrictief en anderzijds faciliterend en stimulerend optreden richting aanbieders van deelmobiliteit.



## Summary

Medium-large cities in the Netherlands are under increasing pressure due to a growing population, a rising housing shortage and limited space. As a result, cities have to deal with urban densification, which requires smart and creative solutions regarding the use of scarce space. Research shows that shared cars are able to replace on average four to ten private vehicles in the long term (Shaheen, 2007). This means that a lot of valuable and scarce space can be saved on parked private cars in the city. Shared mobility is therefore seen by municipalities as a solution to the problems of densification in the city. As a result, there are more and more municipalities using parking policies to influence shared mobility. By applying certain policy interventions, an attempt is made to bring about a change in the presence of shared mobility and the use of limited space in urban areas. However, literature and practice show that there is still insufficient knowledge about the effect of parking policy on shared mobility in the city.

Therefore, the aim of this study is to gain insight into the extent to which shared mobility is influenced by parking policy in medium-large cities in the Netherlands. Moreover, this research focuses specifically on the case of Arnhem on the basis of which recommendations are made. All this results in the main question: *“To what extent can the parking policy of medium-large cities in the Netherlands influence the role of shared mobility in the city, and how can this contribute to the goals of parking policy in Arnhem?”*. This was investigated on the basis of a desk research, a multiple case study and the single case study on the case of Arnhem. Document-analyses were performed and interviews were held with policy officers from municipalities and shared mobility providers.

Following from the research, it can be concluded that the parking policy of medium-large cities in the Netherlands can indeed influence the role of shared mobility in the city. First of all, parking policy influences the business climate for shared mobility in a city. Factors, such as use of space, densification and mobility, are influenced by policy interventions, influencing people's travel behavior and shared mobility. Secondly, it can be concluded that parking policy has a direct effect on the possibility for shared mobility providers to offer, or not to offer, shared mobility in the city. By using permits for shared mobility, municipalities have a great deal of influence on the entry of shared mobility in a city. Finally, the designation of fixed locations for shared vehicles by municipalities has a major influence on the presence and use of shared mobility in the city. After all, the visibility of shared mobility can have an important influence on people's travel behavior through nudging. The visibility of a shared vehicle is closely related to its use and therefore the presence of shared mobility in the city.

Based on this, it has been examined which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy in order to achieve the goals. Parking policy must take into account forms of escapism that can hinder the success of shared mobility. In addition, the policy should not only focus on commercial sharing, but also on private sharing. Transparent communication with providers of shared mobility and including their wishes in the formulation of policy is also desirable. Finally, it is important to find a good balance between restrictive action on the one hand and facilitating and stimulating action by municipalities towards providers on the other.

## Preface

In front of you lies the thesis 'Parking in the city: take it or share it?'. It has been written to fulfill the requirement of the program of Spatial Planning at the Radboud University in Nijmegen. The research and writing of the thesis was carried out from March until the beginning of July 2021.

The research was also carried out on behalf of the municipality of Arnhem, where I did a graduation internship for four months. During my internship, I was given the opportunity to gain work experience, make connections and conduct my research to the best of my ability. Maarten Bulsink personally supervised me during this period in which he was closely involved with the project and he was always open to interesting discussions with useful advice. I have experienced this collaboration as very pleasant. In addition, my supervisor dr. Sander Lenferink from the Radboud University helped me from the early stages of the research with giving direction to the research, in which he was always open to providing helpful feedback. I would like to thank my supervisors for their excellent guidance and support during this process.

Furthermore, I wish to thank all participants of the interviews for their time, effort, as well as their valuable knowledge and experience. Without them I would not have been able to conduct this research. In addition, I would like to thank my girlfriend, family and friends for the motivation they gave me during the writing of my thesis.

I hope you enjoy your reading.

Ward de Jong

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# 1. Introduction

## 1.1 Problem statement

Medium-large cities in the Netherlands are under increasing pressure. In addition to the popular cities of Amsterdam, Utrecht and The Hague in the Randstad, medium-large cities are increasingly popular among citizens. The supply of sufficient housing is currently the biggest problem on the Dutch housing market, resulting in a rising housing shortage (Boelhouwer, 2020). Due to the lack of available housing in the big cities, people tend to move towards other popular residential locations. Therefore, the space in these medium-large cities is becoming more and more under pressure. As a result, cities have to deal with urban densification, which requires smart and creative solutions regarding the use of scarce space. However, we do not always see this reflected in the policy of municipalities in the Netherlands. This is also applicable to parking policy. It will become clear that municipalities do not always have an efficient parking policy with a view to the use of space. Yet there are cases where creative measures have been taken, such as lowering the parking standard when shared mobility is offered.

### 1.1.1. Parking policy

Municipalities in the Netherlands are themselves responsible for the parking policy and associated parking standards in their city. Parking standards have a major effect on affordability, density, mobility choice and feasibility of inner-city area transformations (BPD, 2018). However, many municipalities are not aware that parking standards have these significant effects. Municipalities often base their parking standards on CROW guideline figures (Provincie Zuid-Holland, 2017). The CROW, a knowledge platform for mobility, publishes these guidelines to give an indication for municipalities. In practice, however, municipalities often make these guidelines the norm. Some municipalities are more flexible when it comes to parking standards, but that is the exception rather than the rule. The CROW itself however, is against using their available target figures as parking standards and emphasizes the importance of customization (CROW, 2014).

By using the target figures made by the CROW, many municipalities end up with too rigid standards. In order to make their cities more attractive and manage their mobility, many municipalities are striving to shift from car use to the use of other modalities such as public transport and bicycles (Nieuwenhuijsen & Khreis, 2016). However, this is not always reflected in their parking policy. The vast majority of municipalities apply parking standards that conflict with the policy to reduce car use (Das & Jansen, 2016). By increasing the flexibility of parking standards, different aspects influencing the need for parking places, such as the target group and availability of public transport, can be considered for more custom standards (CROW, 2018).

Some examples exist of experiments in which parking standards were lowered in order to realize a decrease in car use. This resulted in complaining car users because of a lack of parking spots, resulting in a situation in which more parking spots or permits had to be realized afterwards (van de Coevering et al., 2008; Gemeente Amsterdam, 2017). The presence of alternatives to the car, such as an extensive public transport system, were not resulting in a decrease in car usage. It is often seen that areas with a low rate of car ownership, such as inner-cities, do not explicitly influence the behavior of the people. There is rather an 'attractive effect' in which people without owning a car attract other non-car owners (Van de Coevering et al., 2008).

This shows that it is not a matter of just lowering the parking standards in order to change aspects, such as travel behavior and car ownership. It is rather a complex system in which factors, like parking standards and public transport, influence multiple aspects, such as car ownership and the presence of shared cars. In the next chapter, it becomes clear that nowadays, instead of just lowering the parking standard, some municipalities choose shared mobility as an alternative.

### 1.1.2. Shared mobility in parking policy

More and more cities are using parking policies to influence shared mobility through alternatives to personal ownership of cars. In a recent policy document about parking standards, the municipality of Amsterdam stated that they expect the demand for car sharing to increase by working with modest minimum parking standards (Gemeente Amsterdam, 2017). This can be in the traditional form with a reserved parking space on the street, but also in the form of reserved cars on site. In this way, the municipality of Amsterdam is trying to influence the demand for shared cars by adjusting the parking standards in the parking policy.

#### **Box 1 - Stimulating developers to reduce parking via car sharing in Austin**

In Austin, as in Amsterdam & Rotterdam, it is possible to create parking spaces for shared cars instead of regular car parking spaces for developers on site. A parking space for a shared car replaces a significant amount of 20 regular parking spaces in Austin. By offering a shared mobility concept, the parking standard can be reduced by 40%. The applied number of 20 parking spaces per shared car in Austin is above the actual replacement ratio given by Shaheen (2007). The desire to stimulate car sharing may explain this choice of the city of Austin. In the case of the Austin program, the need for about 1,100 parking spaces was reduced in three years' time, saving developers over \$ 38.5 million (Urban Land, 2019).

An important measure in the parking policy of the city of Amsterdam is the lowering of the parking standard when shared mobility is offered. Amsterdam has the rule that, in the development of new houses, the minimum number of off-street parking spaces is reduced by four for each shared car provided (Gemeente Amsterdam, 2017). The condition is that binding agreements have been made between project developers and car-sharing providers to guarantee long-term certainty. In Amsterdam, this rule applies to a reduced parking standard of 20 percent lower than the normal minimum parking standard. A big advantage of this rule is the fact that less space is required for parking spaces when building new homes. In general, shared cars are able to replace on average four to ten private vehicles (Shaheen, 2007). Here we see that the applied number of four parking spaces per shared car in Amsterdam is the minimum replacement ratio. By these means, the city of Amsterdam appears to be playing safe (unlike Austin in the United States, see Box 1), but tries to influence shared mobility. In addition to Amsterdam, Rotterdam has also included similar rules on shared mobility in their parking policy. This is a replacement ratio of five, meaning that the minimum number of off-street parking spaces is reduced by five for each shared car, up to 20% of the parking norm.

Despite the fact that many municipalities in the Netherlands use the standard parking standards of the CROW, there are still some examples (Amsterdam & Rotterdam) where flexible parking standards lead to a different use of space and the presence of shared mobility. While space is saved, a considerable amount of money is saved as well by reducing the absolute number of parking spaces. By adjusting the parking policy, an attempt is made by municipalities to influence shared mobility in the city.

## 1.2 Research aim and questions

Wrapping up, more and more municipalities are using parking policies to influence the use of shared mobility through offering alternatives to personal ownership of cars. A great example of influencing car sharing was given by the cities of Amsterdam and Rotterdam. By offering the option to realize fewer parking spots when shared mobility is offered, it is made more attractive for involved actors to implement shared mobility. This can be seen as an attempt by a municipality to indirectly influence shared mobility by changing parking policy.

The aim of this study is to gain insight into the extent to which shared mobility is influenced by parking policy in medium-large cities in the Netherlands, and what lessons can be learned for the city of Arnhem to influence shared mobility with parking policy. An attempt will be made to get a clear picture of the extent of influence in the relationship between parking policy and shared mobility. This allows municipalities to make better policy choices in their parking policy on the basis of this research regarding the management of shared mobility in the municipalities. Subsequently, this understanding contributes to the aim of improving spatial design and land use, which complement accessibility and travel behavior in and around the city. Special attention will be given to the case of Arnhem in order to make it possible to zoom in more deeply on a case. For example, aspects such as the political context, different stages in the policy process and the broader context of the objectives in the policy can be included in the research. Doing research into the case of Arnhem will result in specific recommendations regarding the aspects which the municipality of Arnhem should take into account when including shared mobility in their parking policy. This will be related to the objectives that are central to the parking policy of the municipality of Arnhem.

In order to achieve this research aim, the following research question has been formulated: *“To what extent can the parking policy of medium-large cities in the Netherlands influence the role of shared mobility in the city, and how can this contribute to the goals of parking policy in Arnhem?”*, with the following sub-questions:

1. How do municipalities incorporate shared mobility in their parking policy?
2. To what extent are the inclusion of shared mobility in parking policy and the presence of shared mobility in a municipality affecting each other?
3. Which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy in order to achieve the goals?

## 1.3 Relevance

The outcome of the research will be important for both practical as well as scientific knowledge. The outcomes of this research will be of practical relevance for medium-large cities in the Netherlands, in particular the municipality of Arnhem. However, the research must also be sufficiently scientifically relevant in order to contribute to theory. Due to this dichotomy, the relevance is divided into a societal and a scientific relevance. Societal relevance is about contributing to the solution of a socially relevant theme, which is in fact a practical solution. In the scientific relevance of a study, the extent to which the outcomes will contribute to existing knowledge will be explained (Van Thiel, 2014).

### 1.3.1 Societal relevance

Medium-large cities in the Netherlands are under increasing pressure from both the growing population and the limited space available. This, in combination with climate change, sometimes requires major changes in our society. The sharing economy has become more important as a way to achieve more resource efficiency in the sustainability transitions (Botsman, 2011). Shared mobility is seen as an important part of the sharing economy which offers sustainable solutions in the field of mobility. Despite the fact that shared mobility only plays a small role in our transport system, it may play an important

role in a sustainable future. The growing role of shared mobility in our society underlines the social relevance of research with regard to this topic.

As we have seen in the problem statement, attempts are already being made in certain cities to influence shared mobility by means of parking policy. This research is focusing on the question to what extent parking policy is influencing shared mobility in medium-sized cities in the Netherlands. As discussed earlier, parking policy can have an enormous effect on matters such as mobility choice, affordability as well as density, and that municipalities are often unaware of these influences (BPD, 2018). By better understanding the effect of parking policy on shared mobility, municipalities will have more knowledge of the effect their own policy has on shared mobility in the city. Thus, more insight is provided into the consequences of the actions taken by municipalities in their parking policy. This should make decision-making and the associated considerations easier and more transparent for the actors involved in the future. In this study, therefore, a contribution will be made to the solution of a socially relevant theme.

At the same time, the research offers points of departure for municipalities to better influence shared mobility on the basis of parking policy. This is not just about gaining insight into the degree of influence of parking policy on shared mobility, but the focus is on actually influencing shared mobility through parking policy. The research will reveal which aspects must be taken into account when trying to influence shared mobility with parking policy. This allows municipalities to contribute to the improvement of spatial design and land use, which complement accessibility and travel behavior in and around the city.

### 1.3.2 Scientific relevance

Recently, a fair amount of research has been written about the shared economy (Meelen & Frenken, 2015; Henrich, 2013; Stemler, 2016; Botsman and Rogers, 2010) and the additional concept of shared mobility (Frenken, 2015; Shaheen et al., 2015; Katzev, 2003). Research has also been conducted into parking policy and its policy interventions (McShane & Meyer, 1982; Shiftan & Burd-Eden, 2001; Verhoef et al., 1996). In this study, these themes are linked together with a central focus on the influence of parking policy on shared mobility. There appears to be a so-called knowledge gap in the literature regarding this relationship. This is partly due to the fact that shared mobility in its current form has only recently received wider attention among urban planners, policy makers and scientists. As mentioned above, this resulted in a fair amount of research that has been carried out on shared mobility, but there are still many aspects which remain unclear and which are not covered in previous research. Additionally, it is a very recent trend that parking policies are used to influence shared mobility. Before, including shared mobility in parking policy was virtually unthinkable. As a result, little is known in the literature about the influence of parking policy on shared mobility. By doing research on the question to what extent the parking policy of medium-large cities in the Netherlands can influence the role of shared mobility in the city, a contribution to the literature regarding the influence of parking policy on shared mobility will be given.

To explain the relationship between parking policy and shared mobility on the basis of theory, theories concerning human behavior and influence play an important role in this research. After all, we will have a look at the influence of certain policies that are strongly related to human behavior. Shared mobility is closely related to people's behavior through aspects such as psychological ownership (Pierce et al., 2003) and the shift from ownership to access in the shared economy (Botsman and Rogers, 2010). Parking policy is also linked to behavior because it can affect our travel behavior (McShane & Meyer, 1982; Shiftan & Burd-Eden, 2001). Since shared mobility and parking policy are closely related to human behavior, the existing literature on human behavior will be taken into account when analyzing the results of this research. In the existing literature, of which the Theory of Planned Behavior and the Reasoned Action Approach by Azjen (1991) are included in this research, much is known about explaining and changing behavior. Moreover, theories about our unconscious behavior (habitual behavior) will be contributing to this research. After all, it turns out that changes in our behavior through

certain policies often affect our unconscious behavior. Therefore, in this study, the effect of parking policy and shared mobility on people's behavior will be explained on the basis of nudging theory. It is clear from the existing theory that nudging influences the unconscious behavior of people. This influence will play an important part in this research and will help to explain the relationship between shared mobility and parking policy.

The above-mentioned theories will be used to clarify and explain aspects and will be examined in contextual situations in this research. Therefore, this research will contribute to the discussed theories regarding behavior and influence in relation to parking policy and shared mobility.

#### **1.4 Further reading structure**

In this introductory chapter, the main and sub-questions that are central to the research are discussed. These questions form the structure for the rest of the thesis. The societal and scientific relevance were also explained. Chapter 2 will further elaborate on this scientific relevance by discussing the relevant theories that are being used in this research. Chapter 3 will discuss the way in which the research was conducted in the methodology. In the following chapters, the results of the research will be elaborated on the basis of, among other things, a desk research and a multiple case study. In the final chapter of the thesis, Chapter 7, the main conclusions of this research will be discussed and there will be room for reflection and discussion regarding this research.

## 2. Theoretical framework

A theoretical framework gives the research a strong scientific basis and provides guidance for the rest of the thesis. According to Van Thiel (2014), in the theoretical framework, *“...the researcher indicates what kind of answers the existing theory provides to the main research question and sub-questions”*. In this chapter, relevant concepts, definitions, models and theories related to the research topic will be presented.

### 2.1 Shared economy

The growth of various shared economy platforms such as Airbnb, Uber and Parkhound shows that the sharing economy is on the rise. For example, spare bedrooms are offered to consumers who need one via the well-known Airbnb. A car can easily be shared via Uber in the form of a tax service. And if you have a parking space, it can easily be offered via the Parkhound platform. These are some examples of successful shared economy platforms that bring together supply and demand in the form of sharing (Stemler, 2016; Huckle et al., 2016).

The shared economy can be described as: *“...the phenomenon of consumers allowing each other to use their unused consumer goods, possibly against payment”* (Meelen & Frenken, 2015; Frenken et al. 2015). This definition shows that it concerns goods that are shared in use which results in a better utilization of the products. In addition to the definition of Meelen & Frenken (2015), the definition given by Henrich (2013) is more focused on a set of systems the shared economy is consisting of. According to Henrich (2013), the sharing economy *“...refers to economic and social systems that enable shared access to goods, services, data and talent”*. Here it becomes clear that the set of systems results in access for consumers to shared products.

#### Growth of shared economy

There are three interconnected forces that resulted in the growth of the sharing economy: modern trust, technology, and economic pressure (Stemler, 2016). Modern trust is a system of measures in which the reliability of users has been increased. Sharing goods requires trust between users. In order to stimulate this trust, the system of evaluation and review has been created on various platforms. Users give each other feedback after a transaction has taken place. In this way, a system is created in which the reliability of users is assessed. This is called modern trust, which is seen as an important "guarantee" in the sharing economy.

Just like modern trust, technology is essential for the development of the sharing economy. This is due to the following three aspects: it allows for the free flow of information, it reduces transaction costs, and it regulates behavior (Stemler, 2016). A free flow of information is very important to bring users together. Without technology, the access to information is limited which is a structural constraint on the supply for a given market (Stemler, 2016). Technology makes it possible for consumers to be aware of each other's supply and demand, so that a market can function properly. This lowers transaction costs due to the fact that the efficiency of the market increases. Furthermore, technology regulates behavior by means of rules which are attached to a platform. Users must adhere to these rules in order to be allowed to the platform.

The third factor in the rise of the sharing economy is economic pressure. During the global financial and economic crisis between 2008 and 2010, alternative perspectives on capitalism and consumerism have been voiced (Henrichs, 2013). This demand for a different way of consuming has contributed strongly to the growth of the sharing economy.



### Access without ownership

The published work called “*What’s Mine is Yours*”, written by Botsman and Rogers (2010) is often seen as a key publication of the sharing economy. They argue that the way of consumption has changed enormously in the 21st century and will continue to do so. This is mainly due to the fact that the sharing economy allows access to resources without ownership (Botsman & Rogers, 2010). By offering for example shared cars, there is an opportunity for people without owning a car to still gain access to a car. In this way a market is created in which ownership is not central, but rather the degree of accessibility to a good. According to the authors, this way of so-called ‘*collaborative consumption*’ will change mainstream economies and ways of consuming, improve social cohesion, and contribute to the minimization of resource use (Botsman and Rogers, 2010). The shift from ownership to access also breaks open a market in which new supply and demand is presented. All this is the reason that the sharing economy is increasingly seen as a game changer in our society.

#### 2.1.1 Psychological ownership

The work of Botsman and Rogers (2010) shows that consumers do not need to own a resource to gain access. In the shared economy, our view of ownership of goods is changing due to a new way of consuming. In practice, it appears that ownership is experienced in different ways by individuals. This concerns psychological ownership. For example, our perception of ownership influences the way we deal with objects.

In order to better understand psychological ownership, the concept itself will first be explained. Pierce et al. (2003) define psychological ownership as a “..state where an individual feels as though the target of ownership or a piece of that target is ‘theirs’”. This concerns the relationship between a person and an object, or resource. A difference must be made in this regard in legal ownership on the one hand, and psychological ownership on the other. Legal ownership means that ownership is formally recognized, while psychological ownership involves the experience of an individual's ownership (Pierce et al. 2001). The two concepts are different from each other. Someone may have legal ownership of an object, but may experience a low level of psychological ownership. However, a person can also experience psychological ownership while there is no legal ownership.

According to Pierce et al. (2003), there are the following fundamental human motivations that cause psychological ownership: efficacy, self-identity and belonging. Efficacy means that people want to have control over their environment. Self-identity concerns wanting to identify with a certain object. The last motivation that causes psychological ownership is belonging, which means that people spend resources on an object that they believe belongs to them. These “needs” cause psychological ownership which results in certain outcomes: responsibility, effort and sacrifice (O’driscoll et al. 2006). For instance, a high degree of psychological ownership can lead to a higher degree of sense of responsibility for an object. An example of this is that people drive more carefully in a private car than in a shared car (Bardhi & Eckhardt, 2012). This shows that the degree of sense of ownership influences our behavior with the object.

It becomes clear that psychological ownership is experienced individually, and that this is different for each person. This degree of psychological ownership influences the use of objects. This is an important aspect in the shared economy in, among other things, the use of shared mobility, as we just saw when using a shared car as opposed to a private car.

## 2.2 Shared mobility

This section deals specifically with shared mobility, which is part of the shared economy as discussed above. In this study, shared mobility is understood to mean the following: *“shared mobility is the denominator of various forms of mobility in which a vehicle is used together, or a vehicle is used as an alternative to possession”* (Frenken, 2015, p.4). As discussed earlier, the sharing economy allows access to resources without ownership. This also applies to shared mobility. The phenomenon of shared mobility is based on the distinction between access and ownership (Katzev, 2003). According to Chen (2009), ownership is a long-term interaction with an object, whereas access is a temporary and circumstantial consumption. This shows that shared mobility is linked to access, which is an alternative to ownership to which Frenken (2015) refers.

The different forms of shared mobility that are distinguished in this study are car-sharing, bike sharing and scooter sharing. These forms of shared mobility will be explained in the next two subsections.

### 2.2.1 Carsharing

Car sharing systems offer users access to shared cars for short-term daily use (Martin et al., 2010). This is reflected in the fact that in most cases several members throughout the day access a shared-use vehicle. The shared cars used by car sharing providers are often spread over a certain service area, such as a city region, where there is a large enough market to support it (Martin et al., 2010). In most cases, users can access the shared cars at any time with a reservation and are charged per time and often per mile. However, we see that the implementation of shared cars can be implemented in different ways. In general, a distinction is made between four different forms of car-sharing (Becker et al., 2017):

- Round-trip carsharing
- Peer-to-peer carsharing
- Point-to-point station-based carsharing
- Point-to-point free-floating carsharing

Round-trip car sharing, often referred to as 'traditional car-sharing', is characterized by the fact that users return the shared car to the same location where the shared car was collected (Le Vine, Lee-Gosselin, Sivakumar & Polak, 2014). In this case, there is therefore a fixed location for the shared cars, and users pay based on the distance or time driven. The pitches are often chosen at geographically strategically accessible points.

Peer-to-peer car sharing is like round-trip car-sharing where users must return the car to the point of arrival at the end of their trip. However, peer-to-peer car sharing allows car owners to use their personal vehicle as a shared car that can be rented to other drivers on a short-term basis (Hampshire & Gaites, 2011). Here too, payment is often made on the basis of distance or time traveled.

Point-to-point station-based car-sharing is a form in which the shared car does not have to be returned to the same place as the pick-up point, but fixed parking spaces are used within a service area (Le Vine, Zolfaghari & Polak, 2014). In this system, therefore, there are several parking places where shared cars continuously rotate the location. In contrast to round-trip car sharing, this form is therefore also called one-way car sharing.

Point-to-point free-floating car sharing allows customers to pick-up and drop-off the vehicle anywhere within a service area (Becker et al., 2017). This form of car sharing has even fewer restrictions than station-based car sharing. For example, there is no need to make a reservation in advance, and the car does not have to be returned at a fixed location. This is also a form of one-way car sharing.

### 2.2.2 Bike & scooter sharing

More and more cities see the bicycle as a way to enhance mobility, reduce congestion and air pollution, improve health, support local businesses, and attract more young people (Larsen, 2013). Ook de (elektrische) scooter wint nog altijd aan populariteit in Nederland (CBS, 2019). The popularity of the bicycle and scooters, in combination with the growth of the sharing economy discussed above has resulted in the growing range of bike- and scooter-sharing systems, especially since the past decade. In 2014, over 700 cities actively operated bike-sharing systems in which around 800,000 bikes worldwide functioned (Meddin & DeMaio 2014). According to Larsen (2013), a bike-sharing system is a distributed network of public bicycles used for short trips. We see here the similarity with car sharing, which also involves a short-term use of the vehicle.

The previously discussed ways of implementing car sharing (round-trip car sharing, peer-to-peer car sharing, point-to-point station-based car sharing & point-to-point free-floating car sharing) can also be applied to bike- and scooter-sharing. In bike-sharing, the difference between station-based and free-floating is especially an important distinction. Station-based means that in an area there are one or more bicycle racks where the shared bicycles can be collected and later be returned in a rack of choice (Shaheen et al., 2015). Here it applies that either one-way or round-trip is possible. Free-floating bike-sharing is without bicycle racks, but the user can pick up and leave a shared bicycle at any location within a geographically defined area (Chen et al., 2018). This is the most common use of scooter sharing in which scooters can be placed at any location within this defined area. Just like with shared cars, this concept gives the user more freedom than with the station-based concept. A big difference, however, is that there are often strict rules regarding car parking, while bicycle and scooter parking often has a more free character within a city. A common consequence is that when free-floating is used in bike- or scooter-sharing, bicycles and scooters are often carelessly and messy parked all over the city. The previously discussed fact that people are more careless with a shared vehicle than with a vehicle they own (Bardhi & Eckhardt, 2012) applies here as well. One benefit to free-floating, however, is that less start-up costs are required compared to a station-based system because there is no need for bicycle sheds or racks placed by the provider (Pal & Zhang, 2017). This often makes free-floating bike- and scooter-sharing an attractive form of implementation for shared mobility providers.

## 2.3 Behavior and influence

Behavior and influence are important aspects in this research. After all, we look at the influence of certain policy that is strongly related to human behavior and the influence on it. In the following sections, the Theory of Planned Behavior and the Reasoned Action Approach will be discussed. Subsequently, habitual behavior will be briefly explained, which will make behavior more clear. Nudging will also be elaborated on, which is mainly about influencing behavior.

### 2.3.1 Theory of Planned Behavior

According to Ajzen (1985), people behave rationally: people take into account available information and implicitly or explicitly take into account the consequences of their behavior. According to Ajzen, people therefore consciously execute behavior, which is the starting point of his "Theory of Planned Behavior" (TPB). This is a widely used model that focuses on explaining and changing conscious behavior. Ajzen's TPB states that conscious behavior stems directly from the intention to display the behavior (Ajzen, 1991). Intention is itself determined by three elements, namely attitude, subjective norm and perceived behavioral control (figure 1).

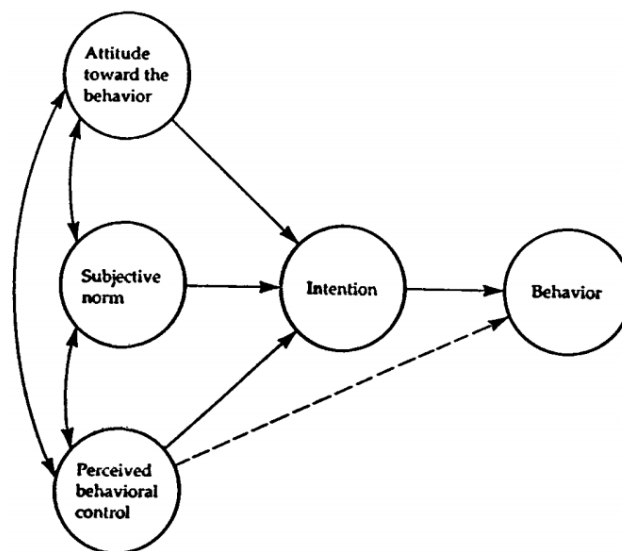


Figure 1: Theory of Planned Behavior (Ajzen, 1991)

The attitude is about a person's attitude towards the behavior and refers to the degree to which a person evaluates or judges the behavior (Ajzen, 1991). The subjective norm is about what the person thinks other people think of the behavior and how they judge it. When the person thinks that others view the behavior as normal or good, the person is more likely to consciously display the behavior. Finally, the observed behavioral control influences our intention. The perceived behavioral control is about the extent to which the person believes the behavior is easy to perform. This concerns both one's own skills and the environmental factors that promote or hinder behavior (Ajzen, 1991). When the person believes that the behavior is easy to perform, the person is more likely to consciously display the behavior.

The Reasoned Action Approach (RAA) is a response by Fishbein & Ajzen (2011) to criticism of the TPB over the years. In particular, the criticism implied that the TPB is based too much on rational behavior and therefore takes less account of cognitive and affective influences on behavior. The RAA therefore adds background factors and behavioral beliefs of the individual that ultimately influence behavior (Fishbein & Ajzen, 2011). The background factors are seen in this theory as the foundation for a person's beliefs, such as the social and cultural context. In the RAA, the attitude is based on behavioral beliefs: the beliefs a person has about the positive or negative outcomes of performing a particular

behavior (Steinmetz et al., 2016). By adding background factors and behavioral beliefs of a person, the model is no longer based only on rationality.

### 2.3.2 Habitual behavior

However, The Theory of Planned Behavior and the later added Reasoned Action Approach still remain under criticism. These theories are based on rational and conscious behavior. Though, in reality there is also unconscious behavior of individuals. In the literature, habits are described as: *"..the learning of sequences of acts that have become automatic responses to certain situations, which may be functional in order to achieve a given result, or to obtain specific goals"* (Aarts et al., 1997). It is this automaticity that ensures that our behavior is seen as habitual behavior. This behavior is reflected in our everyday activities that often involve repetition. Habitual behavior, for example, is strongly applicable to travel mode choice. The choice for a travel mode, may be perceived as not only a rational process, as stated in the TPB, but also originating from habitual behavior (Thøgersen & Møller, 2008). When people have automaticity in their travel mode choice, this has consequences for behavior in the future. This shows that past behavior can often play an important role in predicting future behavior (Bamberg et al., 2003). This fact is often useful when it comes to trying to influence people's behavior. In the next section, the concept of nudging will be discussed, which partly responds to habitual behavior and by which an attempt is made to influence the behavior of persons.

### 2.3.3 Nudging

It has been of all time for governments to find ways to shape the behavior of citizens in order to promote public priorities. Governments, however, are increasingly working to achieve this without making use of economic measures such as subsidies and the like (Benartzi, 2017). To achieve this, the concept of "nudging" is increasingly being under attention. This is a form of influencing behavior in which changes are made to people's environment. The concept of nudging can best be described as: *"any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives."* (Thaler & Sunstein, 2008). Nudging can therefore be seen as a small push in the right direction. In nudging, people are, with subtle changes, unnoticeably stimulated to adjust their unconscious behavior, and thus their habitual behavior. These subtle changes are made in people's environments, changing the context in which people make choices (Marteau et al., 2011). A common example of nudging is offering healthy products in the queue at the checkout instead of unhealthy products. By changing the context of choice, an attempt is made to create a behavioral change among individuals without forbidding any options or changing their economic incentives.

## 2.4 Policy

Parking policy will be discussed frequently in this study. To understand parking policy, it is important to have knowledge of a complete policy process. The policy process is usually illustrated in the simplified model of the policy cycle (Jann & Wegrich, 2007; see figure 2).

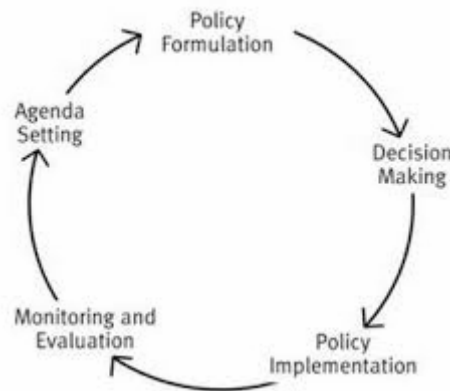


Figure 2 – The Policy Cycle (Wellstead & Stedman, 2015).

The complete policy cycle, consisting of agenda-setting, policy formulation, decision making, policy implementation, and monitoring & evaluation, has become the conventional way to describe the chronology of a policy process (Jann & Wegrich, 2007). However, this chronology has been criticized because in practice, decision-making often does not have this fixed sequence of phases. As a result, the policy cycle, as discussed above, is often seen as an ideal type of rational planning and decision-making (Jann & Wegrich, 2007). This is also one of the main reasons for the success of the policy cycle. It serves as a normative model consisting of rational and evidence-based policy making.

Agenda setting is the first phase of the policy cycle. Agenda setting is the process in which problems and alternative solutions do or do not receive public and elite attention (Birkland, 2007). This phase is therefore about prioritizing problems that may or may not be on the political agenda. The political agenda is the set of problems that can be considered as priorities by political and administrative authorities (Cobb, 1976). In this way, public policy is therefore a reflection of the problems that play a role in our society.

The second phase, policy formulation, then follows, which is also part of the pre-decision phase of policy making. According to Sidney (2007), policy formulation “*..involves identifying and/or crafting a set of policy alternatives to address a problem, and narrowing that set of solutions in preparation for the final policy decision*”. In this phase of the policy process it is therefore important to identify the problem and the policy alternatives, or solutions. These alternatives are then assessed and weighed up in the decision making stage of the policy cycle. In this phase, the objective is also formulated. After all, policy is aimed at the fulfillment of centrally defined policy goals (Pülzl & Treib, 2007).

While the formulation phase is about identifying the alternatives and goals, decision making is about the considerations surrounding these action alternatives (Jann & Wegrich, 2007). Decision making therefore depends on the previous formulation phase in which the basis is laid for the considerations made in the decision-making process.

Then follows the implementation of policy, whereby the formulated and chosen policy is implemented. In this phase, the goals, which have been determined in the policy formulation, are attempted to be



achieved. The moment that policy is implemented by the responsible institutions and organizations is referred to as implementation (Jann & Wegrich, 2007). This phase of the policy cycle is often a crucial phase in which implementation can deviate from what is desired, the policy goals. After all, the choice of a particular policy does not guarantee that the implementation in reality will strictly follow the aims and objectives of policy makers (Jann & Wegrich, 2007). An explanation is given by Hogwood and Gunn (1984), saying that the work of administrative workers cannot be quickly changed by changes in policy. Therefore, there should always be a good evaluation of the implementation of policy, which is the last phase of the policy cycle. Thanks to the evaluation of the chosen policy, it can be determined whether the goals and objectives of the policy have been achieved. However, evaluation is not only used after the implementation, but is used throughout the policy cycle to provide reflection on the process with associated actions and choices (Alexander, 2006).

## 2.5 Parking policy

An important part of this research is parking policy. Parking policy is one of the most powerful tools for urban planners and policy makers to manage travel demand and traffic in the city center (Shiftan & Burd-Eden, 2001). Parking in an area can be influenced in several ways with policy. The various policy interventions in parking policy are: the number of parking spaces, the spatial distribution of parking spots, parking time limits, parking costs, residential parking permits, taxes, employee parking, and degree of enforcement (Shiftan & Burd-Eden, 2001; Verhoef et al., 1996). Often a combination of all these policy interventions is used to manage parking in an area. The policy interventions together form the parking policy.

Parking policy can have an effect on people's travel behavior and can even lead to a change in congestion (McShane & Meyer, 1982). It may encourage people to travel to other destinations, change the time of the trip, and change or cancel their activities (Shiftan & Burd-Eden, 2001). For example, due to a too strict parking policy, companies may move in the long term. This can result in companies starting to spread more in an area, which can lead to more dependence on the car. In such a case, parking policy would lead to more car use, which in itself results in more air pollution and congestion. In this case, the parking policy results in an unintended result because an intended measure does not have the desired effect. This shows that parking policy is often a complicated system in which several factors have to be taken into account.

The scale on which parking policies are applied appears to be important. At larger scales, parking policies may be an effective means for reducing the use of cars in an area (Verhoef et al., 1996). At the local level, however, this does not appear to be the case when strict parking policies are enforced in contrast to the surrounding area. When a parking policy is designed on a local scale (for example a residential area), then spatial "escapism" for parkers must be taken into account. In this case, parkers divert to surrounding areas where a different parking policy applies. Verhoef et al. (1996) point here to the danger of a considerable shift of the "parking burden" from the strictly enforced place onto the surrounding area. In many cities in the Netherlands this is a well-known phenomenon whereby car users park their car just outside a paid parking zone. This is a typical example of spatial escapism of parkers.

## 2.6 Conceptual framework

In the theoretical framework, the most important concepts, definitions, models and theories related to the research topic have been discussed. Based on this theoretical framework, a conceptual framework has been drawn up, shown in figure 3. The conceptual framework forms the basis of the research and serves as the starting point for the research design. Moreover, the conceptual framework will guide the rest of the research and thus contribute to shaping the methodology of the research.

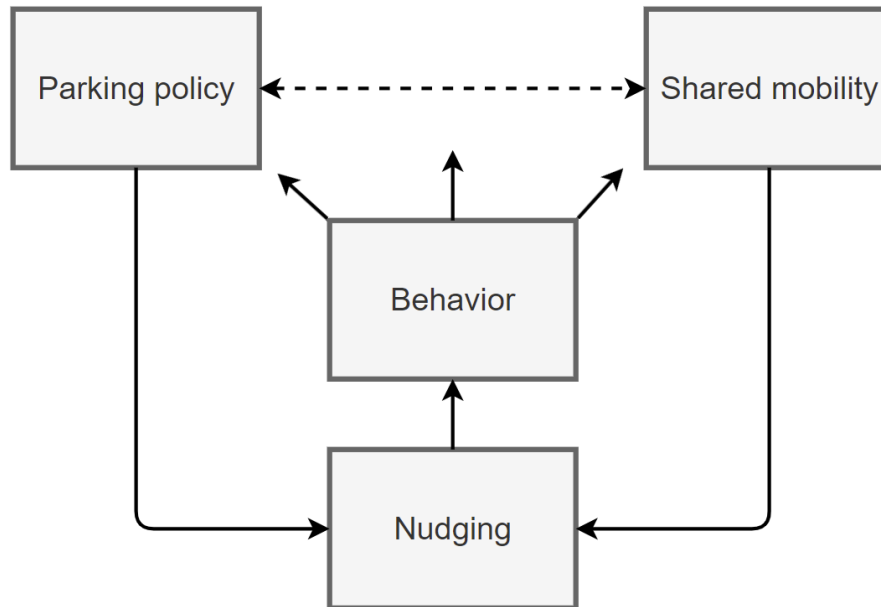


Figure 3: Conceptual framework

Central to this research is the relationship between parking policy and shared mobility, which is reflected in the conceptual framework. The extent to which these variables influence each other will become clear in this study and is therefore indicated with a dotted line. The relationship between parking policy and shared mobility will be explained on the basis of nudging, and its influence on behavior.

In the theoretical framework it has become clear that parking policy can influence people's behavior through policy interventions. Parking policy is about making changes in the 'context of choice' of people that influence behavior. This is the essence of nudging. We see the same influence from shared mobility in which subtle changes are applied to adjust habitual behavior. It became clear that habitual behavior, also known as unconscious behavior, has an effect on the choice for a travel mode. By applying nudging, an attempt is made to cause a change in this unconscious behavior. This change in behavior influences the choices people make, such as choice of travel mode. This affects both parking policy and shared mobility, and the relationship between these two variables. Parking policy is a reflection of the problems that play a role in our society, which arise through human behavior. Meanwhile, shared mobility is directly influenced by behavior through usage. The extent to which behavioral changes due to nudging influence the relationship between parking policy and shared mobility will become clear in this study.

### 3. Methodology

This chapter will explain how the research was conducted and the reasons behind it. The underlying research philosophy will be discussed, followed by the research strategy. Subsequently, the data collection and analysis will be elaborated on. Finally, an extensive discussion will take place of the reliability and validity of this research.

#### 3.1 Research philosophy

The choice of a specific research philosophy is impacted by practical implications and is usually represented in a research paradigm. According to Guba & Lincoln (1994, p.107), a research paradigm can be seen as “...a set of basic beliefs that deals with ultimates or first principles” and which is based on ontological, epistemological and methodological assumptions. The research paradigm can be seen as a representation of the worldview, and is shared and supported by a large number of researchers as a "school of thought" (Van Thiel, 2014). In general, paradigms can be classified somewhere in the framework between positivism, postpositivism, critical theory and constructivism. This research is constructivist in nature, which will be clarified below.

Positivism and postpositivism assume the existence of a "real world" independent of our perception and existence, and that we can acquire knowledge about this reality through our observations, in an empirical way. Research using one of these paradigms as philosophy usually aims to discover and explain patterns that exist in this world (Moses & Knutsen, 2012, p. 15). Because the goal in positivism and postpositivism is to be able to make context-free generalizations, these two paradigms are not applicable to this research. After all, generalizations have been made in this research on the basis of context-dependent case studies.

The critical theory paradigm mainly concerns historical insights and emphasizes critique and transform (Guba & Lincoln, 1994). The critical theory and constructivism are very similar. However, since this research aims to provide insight and contribute knowledge about parking policy (and the aim is not to critique and transform, rather to understand and reconstruct), the critical theory is not in line with this research.

Constructivists, unlike positivists and post-positivists, believe that the world we live in is a socially constructed one. In constructivism patterns that can be recognized do not have a natural origin, but a social one, the patterns are a product of our society (Guba & Lincoln, 1994). Whereas in positivism and postpositivism the researcher plays a minimal role, constructivism assigns this researcher, as well as society, a major role in which it influences the outcome of the research (Moses & Knutsen, 2012). In this research, much use was made of semi-structured interviews in which the researcher cannot avoid directing the research. This research also used a multiple case study. An important way of transferring knowledge in constructivism is sharing "vicarious experiences", often supplied by case study (Guba & Lincoln, 1994). Taking into account the above aspects, and based on the paradigms discussed by Guba & Lincoln (1994), this research can thus be identified as constructivist.

#### 3.2 Research Strategy

In order to ensure that the correct data is collected and results can be presented, it was necessary to determine a research strategy. According to Verschuren & Doorewaard (2015, p. 159), a research strategy is “...a set of interrelated decisions about the way in which you will conduct the research”. This set of decisions concerns choices such as breadth or depth, quantitative or qualitative and empirical or desk research. These interrelated decisions will be explained below.

The study attempts to answer the question to what extent parking policy and shared mobility are affecting each other in medium-large cities in the Netherlands. In order to gain more insight into this relation, research has been carried out both in breadth and in some cases in depth. Broad research is useful so that a general overview could be given of parking policy in medium-large cities first. This benefits from comparing multiple cities so that an overview of the various parking policies was given as complete as possible. In-depth research was also important to further investigate a few cases from this broad research. This made it possible to delve deeper into a number of independent cases in a real-life context. This has resulted in a more detailed picture of the influence of parking policy and shared mobility on each other in a defined setting.

This research fits best from a methodological and philosophical point of view with a qualitative approach: contemplative and in-depth research. It is about "*...retrieving (reconstructing) the meanings that people attribute to 'reality' in order to be able to understand their actions from there*" (Vennix, 2009, p.99). This is in line with the constructivist philosophy of this research, in which understanding and reconstructing play an important role. Qualitative research provides in-depth information by examining the underlying motivations, opinions, wishes and needs of the target group. It examines the relevant opinions, motivations and certain behaviors that are important in this research. In addition, qualitative research could be used effectively in this study to allow the target group to participate in their own thinking about, among other things, the implementation of the improvements in future (parking) policy. This has been very relevant in this research because the knowledge acquired should not only lead to more insight, but also to concrete learning points for medium-large cities in the Netherlands, and Arnhem in particular. This is characteristic for research where policy is the research object. Research that concentrates on the subject of public policy generally aims to contribute to more insight into, and a more efficient use of policies (Van Thiel, 2014). There is usually an intention to improve certain policies by offering recommendations based on the results of the research. In addition to the fact that recommendations arise from this research, concrete learning points have also been provided for the city of Arnhem in light of the third sub-question. It is especially important that target groups can contribute their own ideas about how to implement improvements in future policy in this qualitative research.

Both empirical and desk research have been used in this study. On the basis of desk research it was possible to partly answer the sub-questions of the research. However, in order to gain a complete answer, empirical research had therefore also to be carried out. This has led to the choice to use a combination of two qualitative research strategies: the desk research and a multiple case study. A desk study was suitable for obtaining a broader picture of the parking policy of municipalities in medium-large cities in general. In this way, a lot of research data could be collected in a relatively short period of time. In this research, document analysis has also been used in which existing literature, in particular policy documents regarding parking policy and shared mobility, were studied.

In addition to the desk research, this research therefore also used a case study. In order to answer the questions formulated in the problem definition, empirical research was needed to be carried out. Earlier it became clear that a qualitative approach was chosen in this study. There are many medium-large cities in the Netherlands. Therefore, in line with the qualitative and constructivist approach, it did not make sense to investigate all these cities in the in-depth study part. Rather, it was relevant to gather concrete, contextual and in-depth knowledge about a few specific cities, or in other words, cases. The outcomes of a case study can after all lead to an in-depth understanding of behaviors, processes, practices, and relationships in context (Mills et al., 2017).

For this reason, a case study was chosen: "*a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence*" (Sharp, 1998). According to Verschuren & Doorewaard (2015), a case study distinguishes itself from other research methods by the small number of research units, a selective approach and predominantly qualitative research methods. Since not just one city was investigated in this study, but

multiple cities, this is a multiple case study. The purpose of a multiple case study is to either make a comparison between the investigated cases, or to combine the findings from the different cases into an overall picture (Yin, 1994). In this research, the multiple case study therefore made it possible to make comparisons between cities, but also to provide an overall picture of the influence of parking policy on shared mobility in medium-large cities in the Netherlands. Moreover, researching multiple cases instead of one adds to the reliability of the research. A multiple case study also increases the generalizability of the research, so that events and processes in one context are not fully context-specific (Miles et al., 2014).

In the final phase of the research, the knowledge gained from the desk research and the multiple case study was used for the specific case of Arnhem. By zooming in specifically on the parking policy of the municipality of Arnhem, an attempt has been made to answer the question which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy. This stage of the investigation offered a great opportunity for the municipality of Arnhem to take into account the knowledge gained in the previous phase of the investigation. The research transformed in this stadium from an empirical method to a more normative one in which the gathered knowledge was used to construct recommendations and solutions (Van Thiel, 2014). This also contributed to the main focus of this research which is gaining more insight into the influence of parking policy on shared mobility.

### 3.2.1 Selection

The study examines medium-large cities in the Netherlands. These medium-large cities are cities with a population of between 50,000 and 250,000 inhabitants (G40, 2018). Examples of these medium-large cities in the Netherlands are Nijmegen, Groningen, Venlo and Arnhem. The Dutch medium-sized city is a city with a complete range of facilities and activity that is available to both its own residents and the residents of surrounding smaller agglomerations (Platform31, 2016). As a result, medium-sized cities often play a caring role for the surrounding area. In addition, as became clear in the introduction, medium-sized cities in the Netherlands are under increasing pressure on the housing market. Due to the shortage of housing in the large cities, people are moving to the surrounding, often medium-sized cities. This arrival of a new population, coupled with the nurturing role of the surrounding area, ensures that the space in these medium-large cities is becoming under more and more pressure. This makes medium-large cities in the Netherlands an interesting research group for this research.

In the desk research, in which policy documents regarding parking policy and shared mobility are studied, a selection has taken place. To investigate how municipalities incorporate shared mobility in their parking policy, it was desirable to investigate as many cases as possible, taking into account the limited time available for the research. That is why the aim was to work out a total selection of approximately 15 municipalities. For the selection of these cities, among other things, the G40 city network of 40 medium-sized cities was examined (see box 2). This group of cities is supplemented by medium-large cities that fall outside this network. Subsequently, a selection of 15 cities was made from this list of cities, based on three aspects: whether shared mobility is included in the parking policy, geographical distribution and availability in policy documents. The list therefore only includes cities that mention shared mobility to some extent in their parking policy. In figure 4 the geographical locations of the selected cities are shown in a map.



### Box 2 - G40 City Network

The G40 city network is the network of 40 medium-large cities in the Netherlands. They find each other in the urban issues faced by the members of the network. The 40 municipalities of the G40 are: Alkmaar, Almelo, Almere, Alphen aan den Rijn, Amersfoort, Apeldoorn, Arnhem, Assen, Breda, Delft, Deventer, Dordrecht, Ede, Eindhoven, Emmen, Enschede, Gouda, Groningen, Haarlem, Haarlemmermeer, Heerlen, Helmond, Hengelo, 's-Hertogenbosch, Hilversum, Hoorn, Leeuwarden, Leiden, Lelystad, Maastricht, Nijmegen, Oss, Roosendaal, Sittard-Geleen, Schiedam, Tilburg, Venlo, Zaanstad, Zoetermeer and Zwolle.

The municipality of Arnhem, which is part of the G40 city network, will not be included in this phase of the study. The reason for this is that the Arnhem case will be specifically examined in the later stage of the research. In this first phase, however, it will be examined to what extent other medium-large municipalities in the Netherlands include shared mobility in their parking policy. The cities that were examined, but not named in their parking policy were: Den Bosch, Leeuwarden, Maastricht, Emmen, Breda, Apeldoorn, Alkmaar, Lelystad, Haarlem, Assen, Almelo, Venlo, Amstelveen, Dordrecht, Purmerend, Sittard -Geleen, Roosendaal and Zeist. These are a total of 18 cities out of a total of 33 cities viewed. This shows the ratio of the number of medium-large cities in the Netherlands that includes shared mobility in their parking policy. After all, it means that 15 of the 33 cities surveyed have included shared mobility in their parking policies. However, it should be noted here that for some exceptional cases of medium-large cities in the Netherlands, no policy documents could be found. The ratio is therefore not entirely representative.

Subsequently, it has been investigated to what extent the inclusion of shared mobility in parking policy affects the presence of shared mobility in a municipality. At this stage of the research, a multiple case study has been conducted with 4 cases: Eindhoven, Groningen, Nijmegen and Alphen aan den Rijn. This number of cases has been chosen so that in-depth research is possible, but there is nevertheless a multiple case study in which contextual influences are reduced. This is because each case is a *“..complex entity located in its own situation..”*, with special contexts and backgrounds (Stake, 2013). Using a multi case study, some of these contextual influences are illuminated. The selection of the cases was based on the previous 15 selected cases. This involves looking at the degree of parking policy regarding shared mobility in a single case. The more parking policy there is on shared mobility in a municipality, the more interesting the case will be for this next stage of the research. This "amount" of parking policy can be interpreted as a literal amount, but also as the weight of the parking policy. The actual presence and use of shared mobility in a municipality has no influence in the selection procedure. After all, a case in which there is a lot of parking policy on shared mobility, but where no shared mobility can be found in the city, is also a relevant research case for this study.



*Figure 4: Map of 15 selected cities in deskresearch (black + yellow), 4 selected cities in multiple case study (yellow) and the city of Arnhem (red)*

### 3.3 Data collection and analysis

In this research, different research methods and data sources have been used to collect and process the information. Information from primary sources, such as semi-structured interviews, as well as from secondary sources, such as policy documents, were used to formulate answers to the sub-questions and to the main research question.

#### 3.3.1 Document-analysis

First of all, it has been studied how municipalities incorporate shared mobility in their parking policy. As indicated in the previous section, this was done by examining a wide number of medium-large cities. Policy documents concerning parking policy and shared mobility, such as parking memorandum and policy visions, were studied on the basis of document analysis. In this way, in combination with semi-structured interviews, a picture could be drawn about how different municipalities of medium-large cities in the Netherlands deal with shared mobility in their parking policy.

In addition, a document analysis had to be carried out into the degree of inclusion of shared mobility in parking policy affecting the presence of shared mobility in a municipality. As discussed earlier, this was examined by means of a multiple case study. By studying policy documents, relevant information from the cases could be provided, such as the actual presence of shared mobility in numbers and which providers are involved in the system. An initial indication has also been given of the degree of inclusion of shared mobility in parking policy affecting the presence of shared mobility in a municipality. The interviews were an important addition to this, where questions can be asked about motives, opinions and the like.

In the last phase of the research, an answer has been given to the question which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy. As in the multiple cases, there also had to be sufficient knowledge of the contextual situation in this phase. Here too, aspects such as the presence of shared mobility in numbers and the providing actors in the city played an important role.

#### 3.3.2 Interviews

In addition to document analysis, conducting semi-structured interviews was an important part of the research. The use of interviews, a dialectical method, fits well with the constructivist paradigm which this research can be placed in. Interviews allow respondents to be asked, and asked further, about context-specific aspects. In addition, opinions and motives can be identified and clarified.

First of all, interviews are a good addition to the document-analysis to investigate how municipalities incorporate shared mobility in their parking policy. In addition to analyzing various policy documents, interviews were therefore also conducted with respondents from a limited number of cases. In table 1 is a list of interviewees in this research represented. From the multiple case selection of four cities, an interview has been conducted with a policy officer for each city. This offered the opportunity to elaborate on the choices made by policy officers in policy documents. Through this addition to the document-analysis, a complete general picture could be drawn up of how different municipalities deal with shared mobility in their parking policy. The interview guide used for the interviews held with policy officers can be found in Appendix A.

Naam	Function	Organization	Date
Rogier Dijker	Policy officer Parking & Public Transport	Municipality of Eindhoven	13-04-2021
Davy Beumer	Senior Policy Advisor Mobility & Road Safety	Municipality of Nijmegen	14-04-2021
Freek de Bos	Policy Officer Mobility	Municipality of Groningen	15-04-2021
Stijn Ringnalda	Policy Advisor Mobility	Municipality of Groningen	15-04-2021
Jeroen Verkade	Policy Advisor Mobility	Municipality of Alphen aan den Rijn	28-04-2021
Daan Wijnants	Head of Public Affairs	Felyx	29-04-2021
Bibi Jorissen	Network Manager	Greenwheels	29-04-2021
Maarten Herber	Fleet Operations Specialist	MyWheels	30-04-2021
Pijke Dorrestein	Public Affairs & Trust and Safety	SnappCar	04-05-2021
Maarten Bulsink	Policy Advisor Mobility	Municipality of Arnhem	31-05-2021
Peter Swart	Senior Policy Advisor	Municipality of Arnhem	08-06-2021

*Table 1: List of interviewees.*

To investigate whether the inclusion of shared mobility in parking policy affects the presence of shared mobility in a municipality, interviews have been conducted as well. The four interviews with policy officers from the four cities, from the multiple case study just discussed, also served this sub-question. Two themes were therefore discussed in the interviews with policy officials: how their municipality incorporates shared mobility in their parking policy, and to what extent the inclusion of shared mobility in their parking policy affects the presence of shared mobility in their municipality.

In answering the second sub-question, however, we have not only looked at the municipalities, but we have also had to look into the providers of shared mobility. That is why interviews were conducted with providers of shared mobility which are active in the selected cities. In this way, the cases are looked at in a certain context from different perspectives. By also involving the offering side in the research, there has been more insight into which criteria apply to parking policy for a provider to offer shared mobility. The interview guide used for the interviews held with the providers of shared mobility can be found in Appendix B.

In the last phase of the research, it has been investigated which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy. To investigate this, stakeholders involved in parking policy and shared mobility were interviewed. This concerns policymakers from the municipality of Arnhem who are involved in the city's parking policy. The aim was to obtain in-depth information about parking policy and shared mobility of the situation in Arnhem. In addition, it has been asked how policymakers think about the possibilities of influencing shared mobility with their parking policy. What opportunities and obstacles do they see in this area? With this data, in combination with the knowledge gained earlier in the research, an attempt was made to identify aspects that the municipality of Arnhem should take into account when including shared mobility in their parking policy.

In this study, 9 out of 10 interviews were held online instead of face-to-face. Conducting face-to-face interviews is very difficult due to the current measures against the coronavirus. Conducting the interviews online via Zoom was therefore the procedure in this research. An advantage of conducting

interviews online is that an interview is easily accessible for a respondent, and that travel restrictions are removed for the researcher. However, a disadvantage of online interviews is that certain perceptions, such as facial expressions and hand movements, are less easily perceived than in face-to-face interviews (Janghorban et al., 2014). During the interviews, therefore, the aim has always been to have a good setup of the respondent's camera and such, so that proper attention can be paid to body language. Fortunately, one interview (with Maarten Bultink) could be held face-to-face which gave the opportunity to better anticipate facial expressions and such.

### 3.3.3 Data analysis

During the research an attempt was made to interweave data collection and analysis for the interviews. This contributes to a feedback process in which data analysis can lead to generating new strategies for collecting new and possibly better data (Miles et al., 2014). Therefore, in this study there was no situation in which all interviews were conducted first and then everything was analysed. There was rather a process in which the collection of data in the interviews has been alternated with the analysis to improve the process of data collection.

Before the interviews could be analyzed, they first needed to be transcribed. After that, the interviews were analyzed using a coding scheme in an Excel sheet. It was planned in advance to use Atlas.ti, but unfortunately this program was not available, partly due to the corona measures. Thanks to creating a coding scheme in Excel, it was possible to encode the transcribed interviews. Miles et al., (2014) see coding as a way of "deep reflection" and can therefore also be seen as deep analysis and the interpretation of the data's meanings. Saldaña (2021) makes a distinction between first cycle and second cycle coding. In first cycle coding, large parts of the text are coded to discover the first patterns. This first phase is mainly used to reflect on the collected data. In the second cycle of coding, these parts are divided into smaller numbers or categories in order to clarify the patterns (Miles et al., 2014). By using the first cycle and second cycle of coding in the coding scheme, the analysis of the data from the interviews has been approached as structured as possible. In Appendix C are the first and second cycle of coding represented with examples gathered from the interviews.

### 3.4 Reliability and validity

The research philosophy and the research strategy have been discussed in detail. The different ways of data collection and data analysis have also been worked out. In addition, it is important to explain to what extent the results of the study are reliable and valid, which will be discussed below.

#### 3.4.1 Reliability

The research has been carried out by one researcher, resulting in limited variation in the interpretation of the results. The interviews are also fully transcribed and coded, which contributes to the accuracy of the research. An important element of reliability, in addition to accuracy, is consistency which revolves around the idea of repeatability (Van Thiel, 2014). This means that when the research is repeated in similar circumstances, the same results will come out when the same research methods are used. Because this research makes extensive use of qualitative methods, whereby the researcher influences the research process anyway, repeatability will not fully lead to the same results. However, the methods are explained in such a specific way that would allow repeatability of this research. In addition, the area on which this research focuses, with in particular parking policy, is constantly subject to change. This means that this research in a different time frame might have different results. This should be taken into account when replication will be carried out.

#### 3.4.2 Validity

In this research, the use of triangulation is seen as an important means. According to Van Thiel (2014), *“..triangulation is used to indicate that more than one method is employed in a study, with the aim of double (or triple) checking on the data collection and research results”*. It is a much used strategy for improving the reliability and validity of a research. As became clear in the research strategy, the information has been gathered from multiple sources; persons, policy documents and earlier research done in this field of knowledge. This requires multiple research methods; conducting interviews as well as analyzing documents. This mix of different methods contributes to the internal validity of this research. After all, the results of the different methods can be compared with each other, so that it can be concluded whether the results correspond.

External validity describes to what extent the outcomes of a study can be generalized (Van Thiel, 2014). In general, with a case study, it is difficult to generalize findings to other situations, either because the case is unique or because results only apply to the specific context that has been studied (Flyvbjerg, 2006). The external validity of case studies is therefore limited (Van Thiel, 2014). In this study, however, a multiple case study was chosen, which contributes to a higher generalizability of the findings from this study, as stated in the research strategy (Miles et al., 2014). After all, by conducting a multiple case study, the cases studied can be compared with each other.



## 4. Inclusion of shared mobility in parking policy

This research will first examine how municipalities incorporate shared mobility in their parking policy. To accomplish this, a wide number of medium-large cities have been examined, of which 15 cities have been selected to be involved in this research. In addition, several policy documents regarding shared mobility of selected cities were being analyzed. The keywords that were repeatedly searched for in the documents were: shared mobility, shared transport, shared car, shared bicycle, correction, alternative and circular. In this way, document analysis was used to identify which aspects play a role in how municipalities incorporate shared mobility in their parking policy. These various aspects have been investigated for each municipality and subsequently incorporated in the table below (table 2). The aspects are discussed in the following paragraphs.

	Shared mobility in parking policy	Policy on car, bike or scooter	Commercial and private providers (peer-to-peer)	Correction parking standards shared mobility	Facilitating and stimulating shared mobility	Discount on parking costs (e.g. permits)
Almere	Yes	Car, bike, scooter	-	Mobiliteitsplan, no fixed correction	Facilitating	No
Alphen aan de Rijn	Yes	Car	Commercial and private	Mobiliteitsplan, fixed correction	Facilitating	No
Delft	Yes	Car, bike scooter	Commercial and private	Mobiliteitsplan, no fixed correction	Facilitating and stimulating	Yes
Deventer	Yes	Car	-	Mobiliteitsplan, no fixed correction	-	No
Doetinchem	Yes	Car	Commercial	No correction	-	No
Eindhoven	Yes	Car, bike scooter	Commercial and private	Mobiliteitsplan, fixed correction	Facilitating and stimulating	Yes
Enschede	Yes	Car, bike	-	No correction	Facilitating and stimulating	Yes
Groningen	Yes	Car, bike scooter	Commercial and private	Mobiliteitsplan, no fixed correction	Facilitating and stimulating	No
Haarlemmermeer	Yes	Car	Commercial and private	Fixed correction	Facilitating	No
Heerlen	Yes	Car	-	No correction	Facilitating	No
Hilversum	Yes	Car	-	No correction	Facilitating	No
Nijmegen	Yes	Car, bike scooter	Commercial and private	Mobiliteitsplan, fixed correction	Facilitating and stimulating	Yes
Tilburg	Yes	Car	Commercial	Mobiliteitsplan, fixed correction	Facilitating	No
Zoetermeer	Yes	Car, bike scooter	Commercial	Mobiliteitsplan, fixed correction	Facilitating	No
Zwolle	Yes	Car	-	Mobiliteitsplan, no fixed correction	Facilitating	No

Table 2: Inclusion of shared mobility in parking policy of medium-large cities

#### 4.1 Vision and policy

When looking at the policy documents of various municipalities, it is immediately noticeable that a difference is made between a parking vision and a parking 'nota' by municipalities. The parking vision can be seen as a long-term strategy concerned with describing or depicting a desirable future situation, in this situation about parking. A parking vision therefore often concerns a term of several years. When we apply this to the policy cycle, there is policy formulation and decision making prior to the parking vision. After all, this is about identifying and crafting a set of policy alternatives to address a problem, and narrowing that set of solutions in preparation for the final policy decision (Sidney, 2007). The parking 'nota' of a municipality then flows from this final policy decision. This describes the actual policy so that it can be implemented in practice, the implementation of policy.

A good example to illustrate the difference in parking vision and parking nota is the municipality of Almere. In its parking vision, aimed at the period 2020-2030, the municipality of Almere indicates that the four major cities are already working with shared mobility, but that this is new for Almere. Almere's long-term vision is to stimulate and facilitate shared mobility, because it contributes to a green and healthy city. In addition, shared mobility can offer a solution around junctions where densification tasks are present and space is scarce. Because the role of shared mobility is new, they are developing this framework so that shared mobility can be facilitated in new situations.

In the parking nota on parking standards, the municipality of Almere offers the possibility to deviate from the parking standard when applying new mobility concepts, such as shared cars. In this case they speak of a "norm correction" because the parking norms can be corrected in a specific development. However, it is clearly stated that an initiator must strongly substantiate his plan, because the application of shared mobility is relatively new and the results of these services and products are not, or hardly, known. These assumptions involve the risk that reality will turn out differently than expected, possibly resulting in increased parking pressure in the area.

It therefore appears that a parking vision substantiates the parking policy as described in the parking nota and sets the course for the future. The parking nota concerns the current policy with associated rules, conditions and measures. The distinction between these different policy documents is important for this study. After all, a long-term strategy concerned with describing or depicting a desirable future situation can differ greatly from the actual implemented policy.

#### 4.2 Policy goals

Earlier, Pülzl & Treib (2007) made it clear that policy is aimed at the fulfillment of centrally defined policy goals. These policy goals appear to be the guiding principle in the policy process which is presented in the policy cycle explained by Jann & Wegrich (2007). When the parking policy of the municipalities studied is examined, it turns out that in all cases certain objectives form the basis of the policy. After all, without the objective of a parking policy, it cannot be tested whether the policy ultimately results in the desired outcome (Jann & Wegrich, 2007).

The objectives of the municipalities studied show many similarities. It becomes clear that the parking policy of most municipalities is aimed at managing parking in the city by matching supply and demand. The municipality of Heerlen, for example, has the objective with its parking policy to: *"..ensure a better coordination between the demand for and the supply of parking, without this being at the expense of the quality of life and the quality of the public outdoor space"*. Thus, we also see that parking should not come at the expense of the quality of the public space. The quality of public space appears to be an important objective for almost all municipalities in this study. In most cities there is a shortage of public space due to increasing pressure on the living environment. Beumer (personal communication, 14-04-2021) knows how to interpret the role of parking policy as follows:

*“Parking policy at all, is of course to, what we do in public space, divide scarcity. We do not have enough space for everyone and we have a policy on that. To distribute it as much as possible, but to meet as many people as possible as much as possible. I think that's basically what you base your parking policy on.”*

It thus appears that the distribution of scarcity in public space is also an important objective in the parking policy of medium-large cities in the Netherlands. Chapter 5 will examine in more detail the distribution of scarcity in public space in combination with densification, and to what extent this underlies the relationship between parking policy and shared mobility.

### 4.3 Correction to parking standards

When municipalities apply a parking policy on shared mobility, a trend is clearly noticeable: lowering the parking standards when shared mobility is applied. In total, 12 of the 15 municipalities offer the option of lowering the parking standard if shared mobility is realized (see table 2). In most cases it is argued that shared mobility will lead to a reduction in car ownership because people are in less need of a self-owned car when shared mobility is available. In this section it will become clear that there are various ways in which municipalities implement this lowering of the parking standard. In addition, the conditions will be explained and the municipalities where this option does not exist will be discussed.

An example of a possibility for a correction to the parking standards is the parking policy of Zoetermeer. Zoetermeer includes the option to correct (lower) the parking standard if shared mobility (shared cars and / or shared bicycles) is used, which demonstrably leads to a change in the need for car and / or bicycle parking spaces. The standard correction is based on the assumption that 1 shared car replaces 4 parking spaces for residents (space saving of 3 parking spaces for residents per shared car). For shared bicycles, it is assumed that 5 bicycle parking spaces for residents will be replaced by 1 shared bicycle (space saving of 4 bicycle parking spaces for residents per shared bicycle). In all cases, shared mobility can be declared applicable if a substantiated plan demonstrates the intended solution. We see that there is a fixed correction of the parking standard in Zoetermeer. This means that the proportions, such as 1 shared car replaces 4 car parking spaces, are fixed in advance. Of the cities studied, there are 6 where there is a 'fixed correction of the parking standards'.

However, we do see that a number of conditions are applied to lowering the parking standard through the realization of shared mobility. A clear example of this, also with a fixed correction of the parking standards, is Nijmegen. In the municipality of Nijmegen, in a housing development in an area with paid parking, a lowering of the parking standards can be applied when shared cars are used. One condition is that commercially offered shared cars are made available on site for a minimum of 10 years. For this, a contract must be submitted with a shared car company with a term of 10 years. Other conditions for lowering the parking standard are that the number of car parking spaces to be realized can be reduced by a maximum of 20%, in the ratio 1 parking space for a shared car replaces 4 regular car parking spaces. This has resulted in a reduction of a total of 3 parking spaces and thus a lowering of the parking standard. However, this example shows that this lowering of the parking standard applies to a maximum of 20%. We see this reflected in all municipalities where a fixed correction of the parking standards is present.

An alternative to the fixed correction of the parking standards is the 'mobility plan'. If municipalities offer a lowering of the parking standard through shared mobility, then in this case a mobility plan must be submitted by the party concerned. A detailed, substantiated and feasible mobility plan can influence the ultimate parking requirement and can therefore lead to a reduction in parking requirement. The mobility plan can be clearly illustrated on the basis of the situation in the municipality of Tilburg. In Tilburg it is argued that by offering and stimulating alternative modes of transport, the mobility behavior of employees can be influenced, thus limiting the need for parking. The use of shared cars and

encouraging car sharing between employees play an important role in this. If a company wants a correction to the parking standard, this party must submit a mobility plan. The mobility plan must substantiate how the measure affects car use and what this means for the calculated parking requirement based on the parking standard. Such a mobility plan is then part of the permit application. It remains up to the municipality to assess the extent to which the parking requirement is affected on the basis of the substantiation of a permit application.

We therefore see that in the situation of fixed correction of the parking standards, the change in the parking standard is already largely predetermined. While in the municipalities where a mobility plan must be submitted, the effect on the parking standard is examined per situation. In a municipality where the correction of the parking standard has already been established, there is more certainty for the developing party. After all, with the fixed replacement rate of a shared car in the parking spaces, there is more certainty, since the developing party knows where it stands. When realizing shared mobility, companies in Haarlemmermeer know exactly that one shared car replaces 5 private cars. When the correction of the parking standard is determined on the basis of a mobility plan, the outcome is completely open and the municipality has a free role. It can be said that this provides the opportunity to better assess the situation per case. Many municipalities speak in this case of "customization". A disadvantage, however, is the uncertainty that companies and developers have to deal with because they do not know to what extent the realization of shared mobility will have an effect on the parking standard.

In some municipalities (Doetinchem, Heerlen and Hilversum), no correction to the parking standard is offered when using shared mobility. For example, in Hilversum, car sharing is encouraged by actively participating in initiatives in this area. In general, they argue that the increase in the use of shared cars leads to a slight decrease in the number of (second) cars in the neighborhood. However, they do not yet expect that the increase in shared cars will lead to a decrease in car ownership in Hilversum. As a result, the regulation of a correction to the parking standard when offering shared mobility is not applied in the municipality of Hilversum.

#### **4.4 Carsharing, bike-sharing & scooter-sharing**

As discussed in the theory section, the different forms of shared mobility that are distinguished in this study are carsharing, bike-sharing and scooter-sharing. This distinction also appears to be made in practice. In all 15 cities, the parking policy appears to apply to car sharing (see table 2). Often the parking policy regarding shared mobility of municipalities is completely focused on the car. An example of this is the parking policy of the municipality of Alphen aan de Rijn. In Alphen aan de Rijn, the parking standard can be lowered for certain living and working situations by structurally deploying a shared car, which can be used permanently by the participating users. The policy specifies fixed corrections to the parking standard for the realization of a shared car. However, no mention is made of shared bikes or scooters and the possible corrections to the parking standard on this. Apart from the parking standard, no further attention is paid to bike or scooter-sharing.

Alphen aan de Rijn is no exception in the medium-large cities in the Netherlands when it comes to the distinction of different forms of shared mobility in their parking policy. It turns out that bike- and scooter-sharing has been specifically named, and where policies have been applied to shared bikes and scooters, by 7 municipalities. However, in cases where bike- and scooter sharing is specifically included in the parking policy, shared bikes and scooters often play a minimal role compared to shared cars.

The municipality of Groningen, for example, mentions bike-sharing, scooter-sharing and carsharing in their parking policy. The policy on shared cars in Groningen is well elaborated with a possible correction of the parking standards when submitting a mobility plan, a distinction between commercial and private shared mobility providers (see 4.1.4), and a facilitating and stimulating role in the policy when it comes

to car-sharing. However, there is also policy made about shared bikes and scooters, although this is in a more limited form compared to carsharing. In Groningen they want to offer more alternatives to parking on the street. Alternatives to street parking for visitors to the city are sufficiently available in the current parking garages and in the P + R areas. The wish of the municipality is to make shared bicycles available in parking garages to serve visitors even better. In order to stimulate the intended shift from street to garages, rates for on-street parking will be higher than those in the garages. In this way, bike sharing can help with a shift from street parking to parking in garages. It becomes clear that all the examined municipalities have a policy on carsharing, and less than half of the municipalities have a parking policy on bike and/or scooter-sharing. In general, it can therefore be stated that in the municipalities studied, the role of bike and scooter-sharing in parking policy lags behind the role of car sharing.

#### **4.5 Commercial and private shared mobility providers**

In most cases, the parking policy of the municipalities studied makes a distinction between commercial and private (peer-to-peer) shared mobility providers. We see this distinction reflected in the parking policy of the municipality of Delft, for example. There are currently a few dozen parking spaces for shared cars in Delft. Thanks to the availability of these shared cars, some households are not buying a (second) car. In principle, applications from car sharing companies will be honored. Car-sharing companies have to pay for the construction of parking spaces for shared cars. This relates to commercial shared mobility providers. In its parking policy, the municipality of Delft also indicates that there is a new development: private car sharing, whereby motorists make their car available to others via websites. The municipality indicates that policy rules are being drawn up to be able to handle applications efficiently. In addition, the use of private car sharing will be actively promoted, especially in residential areas with a high parking pressure caused by the car ownership of the residents themselves. This shows that the municipality of Delft makes a clear distinction in its parking policy between commercial and private shared mobility.

However, we see in table 2 that this distinction is not reflected in parking policy in every municipality. Some municipalities, such as Delft, mention both sides of the provision of shared mobility. However, there are also a total of 4 municipalities where only policy has been made regarding commercial shared mobility providers. This is the case, for example, in the municipality of Tilburg, where private shared mobility providers are not discussed. As discussed earlier, the municipality makes it possible for companies to submit a mobility plan so that the parking standard can possibly be lowered when using shared mobility. However, this ignores the fact that citizens can offer private shared cars to each other. Due to the view that shared mobility is only offered by commercial actors, part of the market is not included in the policy.

#### **4.6 Discount on parking costs**

We see that of the cities studied, there are three cities where a discount on the parking costs is offered when shared mobility is realized. The cities concerned are Delft, Enschede and Nijmegen (see table 2). In all these cities, the aim was to reduce costs by offering a discount on the costs of a parking permit.

For example, the parking policy of the municipality of Enschede provides a discount on the costs of a parking permit. Enschede is committed to expanding the range of shared cars in the city. Several providers of shared cars will be actively approached by the municipality to increase the range of shared cars in Enschede. The municipality can facilitate shared cars by reserving parking spaces for shared cars in the right places. As an extra incentive, current and new operators will receive a 50% discount on the required parking permit. This is a substantial discount for the parties involved on the costs of a parking permit for a shared car.

However, we see that offering a discount on the parking costs when shared mobility is realized is not often used by municipalities. It can be seen as a measure to actively stimulate shared mobility. It is therefore no coincidence that of the three municipalities where a discount is offered, all three also take an active role in stimulating shared mobility. This stimulating role of municipalities will be explained in more detail in the next paragraph.

#### 4.7 Facilitating and actively stimulating

When looking at the parking policies of the cities studied, it is striking that municipalities speak differently about their own role in shared mobility. In general, a distinction can be made between facilitating shared mobility on the one hand and actively encouraging shared mobility on the other. In a facilitating role, municipalities offer support in realizing shared mobility. For example, the municipalities of Zwolle consider it important to make visitors to the city and residents aware of the environmental consequences of their choice of transport. The municipality of Zwolle wants to express this in its parking policy, among other things by facilitating shared cars. This means that the municipality of Zwolle offers support to actors who want to make car sharing possible. Facilitation is therefore mainly about providing support for shared mobility initiatives. This can be done by creating a good business climate in which shared mobility is not limited, but rather supported. Most municipalities that play a facilitating role see shared mobility as a good development and would like to help make it possible. Communicating with shared mobility providers and contributing ideas for suitable locations are examples of facilitating action. However, looking for providers and using stimulating measures for shared mobility is not common in these municipalities.

In addition, there are municipalities that take an active role in stimulating shared mobility. This goes a step further than facilitating, since in this case an attempt is made to actually stimulate shared mobility on the basis of policy. In the parking policy of the municipality of Eindhoven, for example, it appears that an active role is taken in stimulating shared mobility. The municipality is in contact with various providers to see whether the range of shared cars can be expanded. In and around the city center area, it is possible to create parking spaces for commercial shared cars in a residential development instead of regular car parking spaces. To promote shared mobility, Eindhoven has drawn up the 'Share Mobility Agenda', which is working towards a city-wide system of shared mobility. In this way, the municipality of Eindhoven tries to stimulate shared mobility by taking the initiative itself.

So we see that when municipalities play a facilitating role, it mainly concerns supporting shared mobility. This mainly concerns not wanting to limit and oppose shared mobility in the city. On the other hand, with a stimulating role, policy rules are applied which actually stimulate shared mobility. We therefore also see that in the municipalities that play a stimulating role, policy rules such as a correction to the parking standard and a discount on the parking permit are more common.

Table 2 shows that almost all municipalities (13 out of 15) play a facilitating role with regard to shared mobility. Of these 13 municipalities, 7 also state that they take an active role in stimulating shared mobility. This shows that all municipalities that play an active role also claim to play a facilitating role.



## 4.8 Conclusion

The research sub-question concerned in this chapter was formulated as follows: *'How do municipalities incorporate shared mobility in their parking policy?'.* This was done by researching the parking policy on shared mobility of 15 medium-large cities in the Netherlands. During the research, several aspects of the parking policy regarding shared mobility were elaborated.

We have seen that the majority of the municipalities surveyed offer an option to lower the parking standard if shared mobility is realized. Subsequently, the distinction between carsharing, bike and scooter sharing were examined. It has become clear that all the municipalities examined have a policy on carsharing, and less than half of the municipalities have a parking policy on bike and scooter sharing. This has made clear, among other things, that the role of bike and scooter sharing in parking policy is lagging behind the role of car sharing. In addition, the distinction between commercial and private shared mobility in the parking policy was discussed. We have seen that the majority of municipalities only focus on commercial shared mobility providers, and not on the private side or shared mobility. Due to the view that shared mobility is only offered by commercial actors, part of the market is not included in the policy. Finally, the role of municipalities with regard to shared mobility in parking policy has been examined. In general, a distinction can be made between facilitating shared mobility on the one hand and actively stimulating shared mobility on the other. It is notable here that almost all municipalities play a facilitating role in the study, while an active role in stimulating shared mobility is rare.

In order to expose the relationship between the various aspects of parking policy regarding shared mobility, the role played by municipalities is of importance. The extent to which a municipality includes shared mobility in its parking policy is highly dependent on the role that municipalities play in relation to shared mobility. We see that, on the one hand, there is a group of municipalities that see shared mobility as a good development and would like to support this by taking on a facilitating role. In this case, it is about not wanting to limit shared mobility and ensuring that there are no barriers to the realization of shared mobility. On the other hand, we see municipalities that indicate that they play a stimulating role in parking policy when it comes to shared mobility. These municipalities not only facilitate, thereby preventing restrictions, but they also play a stimulating role. This means that policies are applied that encourage the arrival of shared mobility. One example is the policy rule discussed earlier in which a discount on the parking costs is given for providers of shared mobility. Applying a correction to the parking standard is also often seen as a stimulating policy measure. It therefore appears that a stimulating role, in combination with a correction to the parking standard and a discount on parking costs, is often used in practice by municipalities. In general, it can therefore be stated that the municipalities that play a stimulating role apply a broader package of policy rules in the parking policy to stimulate shared mobility. The municipalities with a facilitating role, on the other hand, only focus on the fact not to impose any restrictions on shared mobility. The role that municipalities play thus appears to be a strong foundation for how municipalities incorporate shared mobility in their parking policy.



## 5. Shared mobility and parking policy influencing each other

In the previous chapter, we saw how municipalities incorporate shared mobility into their parking policy. In order to better understand the relationship between parking policy and shared mobility, this chapter will examine the aspects underlying this relationship in more detail. In this research, an attempt is made to answer the question: *'To what extent are the inclusion of shared mobility in parking policy and the presence of shared mobility in a municipality affecting each other?'*, on the basis of four cases. First of all, the 4 cities, which serve as the cases, will be briefly discussed one by one with regard to general information about the city, the available shared mobility and the applied parking policy with associated objectives. In the following paragraphs, various aspects of the relationship between parking policy and shared mobility will be discussed. The conceptual framework that is central to this research will serve as the guideline for this chapter.

### 5.1 Case descriptions

The cases are described on the basis of information from documents and the collected data from the interviews with policy officers and the providers of shared mobility active in the cities studied. Table 3 shows an overview containing the most important information of each case with regard to this research.

	Eindhoven	Groningen	Nijmegen	Alphen aan den Rijn
Province	Noord-Brabant	Groningen	Gelderland	Zuid-Holland
Population	235.707	203.105	177.321	110.986
Population per km <sup>2</sup>	2.689 per km <sup>2</sup>	2.549 per km <sup>2</sup>	3.340 per km <sup>2</sup>	879 per km <sup>2</sup>
Current types of shared mobility (with numbers when possible)	Cars (230), bikes*, scooters (400)	Cars (190), bikes*, scooters (400)	Cars*, bikes*, cargo-bikes*	Cars (25), bikes*, scooters (75)
Publish year parking policy	2019	2018	2020	2020
Main goals in parking policy	Facilitating the demand for parking and maintaining or improving the quality of public space.	Keep Groningen optimally accessible, dealing with densification.	Lowering parking standards to encourage sustainable mobility.	Adjusting the parking standards to the situation in practice.

Table 3: General information and numbers of the four selected cities. (\*Number not known.)

#### ❖ Eindhoven

Eindhoven is a city and municipality in the south of the Netherlands, and in the southeast of the province of North Brabant. The city currently has 235,707 inhabitants, making it the largest city of the cases examined in this study. In this study, Eindhoven still falls into the medium-large city category, which was defined earlier as a city with a population of between 50,000 and 250,000 inhabitants (G40, 2018). The fact that Eindhoven is at the upper limit of a medium-large city is reflected in the characteristics of a large Dutch city. One of these characteristics is the amount of shared mobility in the city. The current range of shared mobility in Eindhoven includes 400 shared scooters (200 Go Sharing, and 200 Felyx), approximately 100 shared cars from Greenwheels, MyWheels and Amber, 40 of which have a fixed parking space and the rest free-floating, and 130 private shared cars via the SnappCar platform. In addition, two new locations of MyWheels, and 12 of Greenwheels, are currently being realized. These figures provide a good picture of the range of shared mobility in Eindhoven. However, the shared bikes

and scooters are missing from this list. For the time being, there is no room for shared scooters in the policy of the municipality of Eindhoven. With regard to the shared bicycle, as in every medium-large city in the Netherlands, the Dutch Railways (NS) public transport bicycle (OV-fiets) is available. The success of the public transport bicycle, in combination with the high bicycle ownership of Dutch citizens, ensures that no successful bicycle sharing systems are active in Eindhoven (personal communication, 13-04-2021). Attempts have been made by a few providers, but these were used too little by the residents of Eindhoven. We will see in the other cases that this is a more common situation. However, the share of shared mobility in Eindhoven is still growing. In recent years, both the number of applications for shared mobility permits and the arrival of new providers have increased.

As stated in section 4.2, all municipalities apply formulated objectives in their parking policy. After all, policy is aimed at the fulfillment of centrally defined policy goals (Pülzl & Treib, 2007). Also, the municipality of Eindhoven has included targets in its parking policy. In the 2019 'Nota Parkeernormen', they refer to, among other things, the following objective:

*The municipality of Eindhoven wants to facilitate the demand for parking in such a way that the accessibility of the city as a whole and its various parts can be guaranteed and the quality of the public space is maintained or improved. In addition, the municipality wants to ensure sufficient flexibility to facilitate initiatives in the city.*

In Eindhoven, the emphasis is therefore on facilitating the demand for parking, but this should not be at the expense of public space. At the same time, there is room to facilitate "initiatives" in the city. This also includes shared mobility, whereby the municipality, in addition to facilitating, also plays a stimulating role, in which no obstacles are raised for the provision of shared mobility (Dijker, personal communication, 13-04-2021). In Eindhoven, shared mobility is therefore facilitated and stimulated, but the quality of the public space must be maintained or improved.

#### ❖ Groningen

Groningen is the capital of the Dutch province of Groningen and the largest city in the northern Netherlands. In 2020 the city of Groningen had 203,105 inhabitants. In the field of shared mobility in Groningen, scooters in particular are a popular form of shared mobility in the city. The largest providers of scooter sharing are Felyx and Go Sharing. A pilot was carried out in 2020 in which these two providers offered shared scooters. During this pilot, the number of shared scooters increased to 470, after which the municipality intervened. The municipality of Groningen wanted to limit the supply, which is why the policy subsequently set a maximum of 150 per provider. However, the pilot will end on 1 May 2021 and new permits have been issued to two providers: Felyx and Check, which are both allowed to offer 200 shared scooters. The share of shared bicycles in Groningen is, as in Eindhoven, mainly focused on the OV-fiets. There is currently only a pilot with 24 shared bicycles at a carpool parking lot west of the city. Greenwheels and MyWheels are mainly active in the field of shared cars in Groningen. In this case, it concerns 60 shared cars from Greenwheels and 15 from MyWheels, which will be expanded with another 10 shared cars in the short term. This also shows that the share of shared mobility in the city is still growing. According to Ringnalda (personal communication, 15-04-2021), interest from providers of shared mobility has increased sharply in a short period of time. It appears that current providers want to grow, but also that new providers make themselves known to the municipality of Groningen who want to start in the city. This applies in particular to shared cars and shared scooters. In addition, the municipality is often approached by providers of shared scooters, but there is no enthusiasm for this from the municipality. This is partly due to the fact that the municipality of Groningen believes that the shared scooter will mainly be an alternative to cycling and walking, while the municipality wants to stimulate these forms of mobility.

The parking policy of the municipality of Groningen also has a list of clearly formulated objectives. The parking vision 2018 - 2025 of the municipality of Groningen describes the following objectives:

*The aim of our parking policy has always been to keep Groningen optimally accessible. We maintain that goal, but we also make other choices and set new emphases: (1) we decide that the public space is in principle public, (2) we give more space to 'the street' (greenery and living space in the street), (3) we offer more customization and flexibility, (4) we opt for sustainability, and (5) making money is not the goal.*

The emphasis on a good distribution of public space appears to be an important objective in the parking policy of the municipality of Groningen. Due to the fact that Groningen is a fairly compact city, the population of the city continues to grow and the desire is to preserve the nature around the city, there is densification in the city (De Bos, personal communication, 15-04-2021). This requires a proper layout of the public space, in which parking policy must therefore also be restrictive in terms of the space given to parked vehicles.

#### ❖ Nijmegen

Nijmegen is a city and municipality in the Dutch province of Gelderland, close to the border with Germany. The municipality has 177,321 inhabitants and is the largest city in Gelderland in terms of population and also the tenth in the Netherlands. In Nijmegen, the offer of shared mobility has increased in recent years. As in Eindhoven and Groningen, Nijmegen also has a range of shared cars from the commercial providers MyWheels, Greenwheels and Amber. There are also approximately 120 private shared cars via the SnappCar platform. The shared cars of the commercial provider Amber are all deployed through a European e-hub project. As a result of this pilot project, 10 e-hubs have been realized in Nijmegen to stimulate cleaner transport. These are places in residential areas where facilities for sustainable shared mobility come together, connected to the public transport network. In addition to Amber's shared cars, the e-hubs also offer electric bicycles and cargo bicycles. Currently, only the Dutch Railways with their OV-fiets is active in the field of bike sharing, and no shared scooters are offered in the city. However, the municipality of Nijmegen wants to issue a tender for providers of shared bikes and scooters in the city (Beumer, personal communication, 14-04-2021). An attempt will be made to find two providers who are willing to distribute 200 shared bicycles each across Nijmegen. In addition, the municipality of Nijmegen is also actively looking for two providers, each willing to offer 100 shared scooters. In this way, the municipality of Nijmegen takes an active stimulating role in realizing shared mobility in the city. In addition to this request for shared bicycles and shared scooters, there also appears to be an interest from existing and new providers in offering shared mobility in Nijmegen. For example, Amber, which is active with shared cars in the city, has made it known that they are open to an expansion of the range. This interest from providers on the one hand, and the demand from the municipality of Nijmegen for providers of shared scooters and shared bicycles on the other, shows that there is still sufficient growth potential for the share of shared mobility in Nijmegen.

The parking policy of the municipality of Nijmegen appears to be essentially focused, just like in the municipality of Groningen, on the proper distribution of scarcity in public space. Due to the densification in the city, policies must be implemented to ensure that the space is distributed fairly. According to Beumer (personal communication, 14-04-2021), an attempt is made “...to divide the space as much as possible, but in a way that as much as possible is accommodated to as many people as possible”. This is reflected in the parking vision 2020-2030 of the municipality of Nijmegen:

*Lowering the parking standards is in line with our ambition to stimulate sustainable transport (walking, cycling, public transport, shared mobility, e-hubs) and to enable spatial developments. We do not add extra parking spaces in public spaces to solve parking problems in neighborhoods.*

It becomes clear that for the municipality of Nijmegen the role of parking does not have the leading role in public space. Reducing the number of parking spaces is in line with the trend to stimulate shared mobility, among other things. By filling in the public space differently, it is possible to make other spatial developments possible, such as the planting of greenery or the creation of terraces. The municipality of Nijmegen therefore tries to contribute to solutions for the issues related to densification with its parking policy.

#### ❖ Alphen aan den Rijn

Alphen aan den Rijn is located in the Dutch province of South Holland and has a total of 73,600 inhabitants in the city. With this number of inhabitants, Alphen aan den Rijn is the smallest city involved in this study. The place is surrounded by the major cities of Amsterdam, Utrecht, Rotterdam, The Hague and Leiden. While Eindhoven showed some characteristics of a large Dutch city, Alphen aan den Rijn has fewer characteristics of a city. During the study, it was particularly noticeable that Alphen aan den Rijn has much less shared mobility in the city compared to the previous three cities. There are 5 shared cars from Greenwheels and about 20 private shared cars from SnappCar. In addition to the public transport bicycle of the Dutch Railways, there are no other vehicles and providers in Alphen aan den Rijn. However, while this research is being conducted, there are plans from the scooter-sharing provider Go Sharing to offer shared scooters. Nevertheless, this offer of shared mobility is in stark contrast to Eindhoven, Groningen and Nijmegen, where the offer is significantly higher, where usually several providers are active and where other modalities such as shared scooters are also frequently present. According to Verkade (personal communication, 28-04-2021), shared mobility has “...*never really grown that way because of course the parking policy is such that you can easily park your own car*”. In this case, Verkade refers to the fact that there is virtually no paid parking in Alphen aan den Rijn, and that parking standards have always been quite high until recently. This has partly led to high car ownership and car use in the city. As a result, the interest in shared mobility in the city is still very limited. However, as in the previous cities, there is also talk of densification in Alphen aan den Rijn. Though, here it is limited to the center of the city where additional houses will be built. Verkade (personal communication, 28-04-2021) sees possibilities for shared mobility in the long term, provided this alternative is brought to the attention of residents.

As has just become clear, the parking standards in Alphen aan den Rijn have always been quite high. For this reason, the current parking policy has set the goal that the parking standards better match the parking demand. In addition, the municipality wants to stimulate shared mobility for which the aim is to be able to lower the parking standard. The document 'Parking standards and parking facilities 2020' therefore states the following:

*By structurally deploying a shared car that is permanently available for the participating users, the parking standard can be lowered for certain living and working situations.*

In Alphen aan den Rijn, shared mobility still appears to play a limited role, but the supply does appear to be growing. For the time being, the parking policy of the municipality of Alphen aan den Rijn appears to be primarily aimed at ensuring that the parking standards are properly aligned with the situation in practice. Shared mobility in parking policy is still a very limited part of the policy.

## 5.2 Densification

A recurring phenomenon that underlies the parking policy of municipalities is densification. In all four cases there is some form of increasing pressure on public space due to densification. In the introduction it became clear that space in medium-large cities in the Netherlands is under increasing pressure. The supply of sufficient housing is currently the biggest problem on the Dutch housing market, resulting in a rising housing shortage (Boelhouwer, 2020). This is why cities should start building additional housing. The four cities in this study are also all building additional houses, or have plans to do so. In Alphen aan den Rijn and Eindhoven, for example, parking areas in the center are being removed to make way for houses (Dijker, personal communication, 13-04-2021; Verkade, personal communication, 28-04-2021). In Groningen, it has been agreed with the government that 20,000 houses will be added by 2030 (De Bos, personal communication, 15-04-2021). It has been agreed that this will not take place in new neighborhoods around the city, but that there will be densification in existing neighborhoods. In the city centers and immediately surrounding residential areas, space must therefore be made available for new houses. However, these are areas where space is already quite scarce. This, in combination with a growing population, causes the space in medium-large cities to become more and more under pressure. As a result, cities have to deal with urban densification, which requires solutions regarding the use of scarce space. This is also the reason that all four municipalities see densification as an important driver for parking policy. In chapter 4 it became clear that the distribution of scarcity in public space is an important objective in the parking policy of medium-large cities in the Netherlands. This was also reflected in the four cases discussed in this chapter. De Bos (personal communication, 15-04-2021) describes the role of parking policy in dealing with densification as follows:

*“...the public space does not grow with it. As I always say: your street is not getting wider, your sidewalk is not getting wider, the city park is not growing with it, the Noorderplantsoen is not growing with it. So, the ‘cake’ of public space remains the same, but the amount of people we have to divide it between is constantly increasing. And that means that you also have to be a bit more restrictive in your parking policy about how big a piece of ‘pie’ you want to give to the parked car.”*

The parking policy of municipalities therefore has a direct effect on the distribution of public space. Municipalities try to influence the role of the parked car in public space with the help of parking policy. In medium-large cities in the Netherlands, for example, the parking policy provides an answer to the pressure on public space caused by densification.

At the same time, we also see that the providers of shared mobility aim to reduce car ownership and thus contribute to solving the problems of densification. After all, reducing car ownership means fewer cars on the street. Beumer (personal communication, 14-04-2021), who works for the Municipality of Nijmegen, states the following: *“... There are more and more people who do want to live and work in the city. This urban densification is increasing in Nijmegen. That is not possible with the retention of current car ownership.”* It is therefore desirable to reduce car ownership so that urban densification is possible. Earlier it became clear that the sharing economy allows access to resources without ownership (Botsman & Rogers, 2010). Shared mobility can therefore ensure that users have access to a vehicle and therefore do not need to own a means of transport (Frenken, 2015). This is the reason that shared cars are able to replace on average 4 to 10 private vehicles (Shaheen, 2007). This also appears to be an important objective for the providers of shared mobility. For example, Jorissen (personal communication, 29-04-2021) of Greenwheels indicated that it is their goal to replace private cars on the street with shared cars. As a result, more space is freed up for other things in the public space. This opinion is shared by provider MyWheels: *“The larger goal is that by 2030, of the 9 million cars currently driving around in the Netherlands, only 1 million will be left. So that you have a lot cleaner and a lot quieter cities.”* (Herber, personal communication, 30-04-2021). It therefore appears that the providers are mainly concerned with the efficient use of a car so that space is saved. Dorrestein (personal communication, 04-05-2021) emphasizes this as follows: *“We are not ‘anti-car’, don’t get me wrong, but we are very much ‘anti-parked car’. And you just have to make optimal use of the cars that are there,*

*so that a lot of space would be freed up*". By offering shared cars, an attempt is made to tackle the problem of parked cars that take up a lot of space. Taking this into account, in combination with the theories discussed (Botsman & Rogers, 2010; Frenken, 2015; Shaheen, 2007), shared mobility therefore seems to potentially offer a solution to the problems that arise in cities caused by densification. Public space is under pressure, which means that space in cities is becoming scarce. By offering shared mobility, an attempt is made to reduce the impact on the public space of parked vehicles.

Based on the theoretical framework, it was concluded in the conceptual framework that both parking policy and shared mobility influence people's behavior. We can now conclude that for parking policy and shared mobility, the phenomenon of densification is the underlying reason for bringing about a change in people's behavior. After all, we see that parking policy is trying to find an answer to the densification challenge in cities. By applying a parking policy that encourages shared mobility, an attempt is made to contribute to the densification task by influencing people's behavior. Thus, we see that problems related to densification, parking policy and shared mobility bring together. Parking policy tries to find an answer to the issues related to densification, while shared mobility has that answer. Densification can therefore also be seen as the driving force in medium-large cities in the Netherlands to change people's behavior with parking policy and shared mobility.

### 5.3 Interaction parking policy and shared mobility

The conceptual framework focuses on the relationship between parking policy and shared mobility. It was stated that nudging influences people's behavior and this subsequently influences the relationship between parking policy and shared mobility. This effect will be discussed in detail in section 5.4. However, it must first be examined whether the concepts of parking policy and shared mobility directly influence each other. In the conceptual framework it was concluded that there is insufficient knowledge in the existing theory about the effect of parking policy and shared mobility on each other. In this section it will become clear that parking policy and shared mobility do influence each other directly. This interaction is mainly due to the presence of both phenomena in which the presence of one can lead to the emergence of the other. To explain this interaction, the effect of the presence of shared mobility on parking policy will first be discussed. Subsequently, the relationship will be viewed the other way around: the effect of parking policy on the presence of shared mobility.

As indicated earlier, the shared economy, which includes shared mobility, is a phenomenon that has only become more widely known in recent years. This became clear several times during the research, due to the fact that municipal policy on shared mobility was often made recently or did not yet exist at all. In addition, most providers of shared mobility have only been active for a few years. In these years, both the demand for and the supply of shared mobility have increased rapidly. Jorissen (personal communication, 29-04-2021) also sees the demand increasing: *"You also see a lot of demand, especially from young people. They don't buy a car that quickly anymore. It is no longer always necessary."* For example, if we look at shared scooter provider Felyx, it is noticeable that this provider has been offering scooter sharing since 2017 and they currently own a fleet of 3000 shared scooters. Wijnants (personal communication, 29-04-2021) indicates that there are still sufficient growth opportunities, which is apparent from the fact that Felyx is looking for new expansions in the Netherlands. When considering offering shared mobility somewhere, the added value that can be delivered for residents and the municipality by offering shared mobility is considered. According to Wijnants (personal communication, 29-04-2021), it must be a situation: *"Where we can really solve a problem when it comes to the use of public space and parking, and contribute to a sustainable transition"*. In addition, we also look at the expected use and where potential customers are located. Where there is a demand for shared mobility or where potential users are located, an attempt is made to offer shared mobility. Also, in this case we see the market forces with its supply and demand. So, when there is a demand for shared mobility, providers of shared mobility will offer their vehicles. In this case, sharing mobility will arise in a city and the sharing mobility provider will try to find the potential

user. This is a crucial point with regard to the relationship between shared mobility and parking policy. We see that when shared mobility is offered in a city, but there is no policy in this area yet, municipalities pull the handbrake and start making policy. Jorissen says about this: *"Many municipalities say: 'Stop, we will first write policy because then we can stop this'. I think there are a lot of municipalities in that situation right now"*. We see that this is done, so that municipalities can regulate shared mobility in order to keep a grip on public space. In this case, municipalities want to prevent clouding of the public space due to the presence of shared mobility, as becomes clear in box 3. What we therefore notice is that when shared mobility makes its entrance in a city, the municipality responds to this by drawing up or further expanding the policy. This concerns the general policy on shared mobility, but also the parking policy of municipalities. The effect of the presence of shared mobility in a city on parking policy is particularly clear from the fact that some providers, such as Greenwheels, want reserved fixed spaces for their vehicles because they use a station-based system. For this, a permanent place must be arranged in consultation with the municipality, to which a parking permit is attached. It is mainly these situations in which municipalities wait with issuing permits until appropriate policy has been drawn up, as Jorissen indicated earlier. In this case, shared mobility is making its way into a city and municipalities are responding to this by, among other things, changing the parking policy.

### **Box 3 - Cluttering of the public space: shared scooters**

A common "fear" among municipalities is a situation in which there is no policy in the field of shared mobility, whereby providers of shared mobility are free in their choice and this subsequently leads to clutteriness of the public space. We see this problem especially with shared scooters. Dijker (personal communication, 13-04-2021) says the following about this: *"There is demand, so that in itself is very nice to see that it is being picked up by the market and is a success. But a downside is: things are everywhere, swing everywhere, and are sometimes placed in awkward places"*. According to Ringnalda (personal communication, 15-04-2021), it are also the shared scooters that cause problems: *"We mainly think that shared scooters lead to clouding of public space. They can be easily moved (..), so they can easily fall over and lie anywhere"*. It is becoming clear that shared scooters are a major concern for municipalities. On the one hand, there is a demand for it from the consumer and it is a form of shared mobility, which is what most municipalities like to encourage. On the other hand, it can result in cluttering the public space. We therefore see that some municipalities do show interest, but that they are handled very carefully. Municipalities often show an interest in shared mobility, but the fear of public space becoming obscured can sometimes have a deterrent effect.

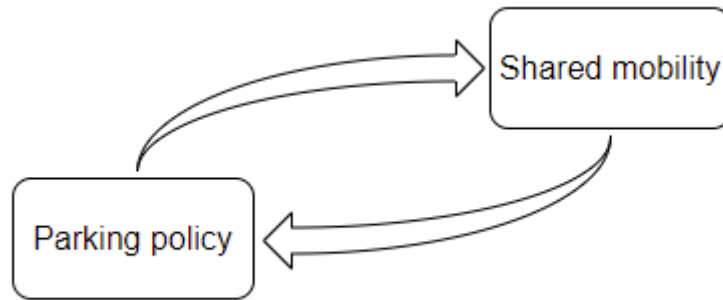
However, the situation can also be reversed. In many municipalities there is a situation in which shared mobility is first included in the parking policy and providers have only later made the choice to offer shared mobility there. In this case, there is therefore policy first and then shared mobility. The reason that municipalities first make the policy is to anticipate the possible problems of shared mobility. This mainly concerns the fact that, according to municipalities, shared mobility can lead to cluttering of the public space if no policy rules apply. Offering shared mobility causes changes in public space. In order to steer this in the right direction, there must be a policy on shared mobility. Parking policy can enable the presence of shared mobility in a structured manner. We see that many municipalities have already thought about their policy or are already applying it before shared mobility has been introduced. A good example of this is Beumer (personal communication, 14-04-2021) about a request for shared bicycles in the municipality of Nijmegen. The municipality of Nijmegen would like to have shared bicycles in the city, but wants to give direction to this itself. The municipality therefore wants to actively conduct a request for two times 200 shared bicycles offered by two different shared bicycle providers. *"Linked to this [the request] is a whole set of policy rules to make this legally possible, to be able to cover it and to be able to place it outside. (..) And we do want to organize that before we issue a request."* (Beumer, personal communication, 14-04-2021). In this case, the municipality of Nijmegen first wants a strong policy with the applicable policy rules, before they allow shared bicycles in the city. We see a similar example in Groningen, where a permit has been granted for two shared scooter providers for which special policy rules have been drawn up by the municipality. For example, the number of shared scooters, the providers and the duration of the permit are regulated by the municipality. These two



examples from Nijmegen and Groningen therefore show that in some cases municipalities first make policy before allowing shared mobility in the city. It should be noted here that two scenarios are possible. On the one hand, providers may have reported themselves and the municipality has therefore decided to draw up a policy before they are allowed to offer in the city. This was the case in Groningen, where several scooter sharing providers have submitted applications for the city. On the other hand, it is possible that there is no interest from providers yet, but that the municipality itself will first draw up policy and then start actively looking for providers, as in Nijmegen.

In the two previous examples, however, we are balancing on the edge of parking policy and general policy on shared mobility. When we look purely at the direct effect of parking policy on the presence of shared mobility in a city, it appears that in most cases there is indeed an effect. For a direct effect, the parking policy should directly influence the choice of shared mobility providers. The interviewed respondents among the providers of shared mobility indicated that the parking policy has an effect on their choice of whether or not to offer shared mobility in a city. For example, Jorissen (personal communication, 29-04-2021) stated the following: *"I think [parking policy] has quite a big influence on cooperation, on the ease of parking. Because of course we would like to place shared cars and if there is either no policy or the parking policy does not match, then we are very much hindered and then we often go to place the cars elsewhere."* This shows that the parking policy does influence the choice of providers, in this case Greenwheels, to offer shared mobility. Wijnants (personal communication, 29-04-2021) of scooter-sharing provider Felyx gives a similar answer in which he states that placing scooters in one municipality can be more difficult than in another, and that this can be a limiting factor in offering shared mobility. Herber (personal communication, 30-04-2021) of MyWheels adds the following: *"There are municipalities that say: 'Yes, great that you are going to put a car somewhere, only we are not going to give you a permanent place'".* According to Herber, this is an example of a parking policy measure that can delay the provision of shared mobility. However, the previous examples can also have a stimulating effect if the policy rules are positive. This concerns, for example, the easy granting of permits by municipalities for fixed places to providers of shared mobility. There appears to be a direct effect of parking policy on the choice of providers to offer shared mobility.

We therefore see that in general two scenarios can be distinguished: first shared mobility and then parking policy, and first parking policy and then shared mobility. In practice, however, it is not always so black and white and there is often a combination of the two scenarios. In most cities there is a situation in which some shared vehicles arrive in the city and some providers of shared mobility approach the municipality to offer shared mobility. This is often the point at which the municipality starts to think about what they want with shared mobility in their city and to make policy based on this. This may take several months to years for this policy to be fully finalized and in effect. During this period, applications from providers of shared mobility are often rejected and the realization of shared mobility in the municipality comes to a standstill. It turns out that the municipality would rather virtually stop the development of shared mobility for a period of time, than that they get an uncontrolled situation in which there is no control on shared mobility in the public space. In general, it can be said that the presence of shared mobility is the first step, after which municipalities will adjust the parking policy and then shared mobility will be influenced. This in turn influences the choices made in policy. In this case one can therefore speak of a 'feedback circle' in which parking policy and shared mobility continuously influence each other (see figure 5). It should be noted that this influence can be either positive or negative. After all, the previous paragraphs have shown that, for example, parking policy can have a stimulating effect on shared mobility, but can also be restrictive.



*Figure 5: Feedback circle of parking policy and shared mobility.*

It has thus become clear that the presence of parking policy and shared mobility continuously influence each other. When shared mobility emerges in the city, we see that municipalities respond to this with their parking policy. After all, they want to prevent providers of shared mobility from going about their business and creating an uncontrolled situation in which the municipality has no influence. In this case we see that the presence of shared mobility leads to the presence of shared mobility in the parking policy. When one arises, the other arises as well. At the same time, municipalities try to prevent shared mobility, and especially the negative sides of an uncontrolled situation, by drawing up policy. This change in the parking policy then has a direct effect on the choice of providers whether or not to offer shared mobility, and thus the presence of shared mobility in the city. It thus appears that parking policy and shared mobility operate in a feedback circle in which they continuously influence each other.

#### **5.4 Nudging and behavior**

The direct effect of parking policy and shared mobility and the vicious circle in which they operate is now clear. However, in the conceptual model it is stated that a change in behavior influences the relationship between parking policy and shared mobility. This change in behavior is caused by nudging from parking policy and shared mobility. In this section it will become clear that both parking policy with its parking interventions, and shared mobility, are forms of nudging that influence people's behavior. Subsequently, the effect of this change in behavior on parking policy and shared mobility will be discussed.

##### **5.4.1 Nudging in parking policy**

The theory made it clear that parking policy is one of the most powerful tools for urban planners and policy makers to manage travel demand and traffic in the city center (Shiftan & Burd-Eden, 2001). In addition, according to McShane & Meyer (1982), parking policy can have an effect on people's travel behavior. This is due to the policy interventions discussed in parking policy, which are explained on the basis of Shiftan & Burd-Eden (2001) and Verhoef et al. (1996). They cite, among other things, the number of parking spaces in a city, the spatial distribution of parking spaces and residential parking permits as important policy interventions in parking policy. By using these policy interventions in the parking policy, people's travel behavior is therefore influenced. This influence can be seen as a form of nudging. Earlier it became clear that in nudging, people are unnoticeably stimulated to adjust their unconscious behavior with subtle changes, and thus their habitual behavior (Thaler & Sunstein, 2008). After all, it is about habitual behavior because the choice for a travel mode, may be perceived as not only a rational process, as stated in the Theory of Planned Behavior, but also originating from habitual behavior (Thøgersen & Møller, 2008). A good example of controlling the travel behavior of people with parking policy is influencing the visual presence of shared cars through parking permits. By making shared mobility more visible, an attempt is made to bring about a change in the choices that people make. This is the essence of nudging. By suddenly placing a shared car in a visible location, a change is made in people's environment. This changes the context in which people have to make a choice for,

for example, the mode of transport, which can lead to a change in their habitual behavior. This is a form of nudging.

In Alphen aan den Rijn, for example, in new construction projects, the idea is to make shared mobility visually present right from the start. *“Put the shared car there immediately and ensure that the bicycle facilities and pedestrian facilities are good (...). And make sure that [private] car parking is further away, and that the shared car is more interesting.”* (Verkade, personal communication, 28-04-2021). The idea behind placing a clearly visible shared car in the street is to increase awareness among people. It is hoped that this will lead to greater use of shared mobility, in other words a change in people's behavior. The visual presence of shared cars in Alphen aan den Rijn can therefore be seen as a subtle change in the 'context of choice' of people, and therefore as a form of nudging.

In addition to making shared mobility visually present, an applied parking standard can also be seen as nudging and lead to a change in people's travel behavior. The parking standard in a city regulates the amount of parking spaces. This is one of the most important policy interventions in parking policy with which parking in an area is managed (Shiftan & Burd-Eden, 2001). After all, the number of parking spaces in the public space has a direct influence on the range of parking options available to the user. It can simply be said that when a high parking standard is applied in a city, there is a lot of space for parking, and thus the use becomes more attractive. In this case, for example, there would be a lot of space to park the car and people will therefore see the car as an attractive option. We also see this situation in one of the cases studied: Alphen aan den Rijn. In this somewhat smaller city in the category of medium-large cities, there is always more than enough parking space due to high parking standards. Verkade (personal communication, 28-04-2021) states the following: *“The parking standards are too high and no longer of this time. More needs to be done on other forms of mobility (...). Car ownership is quite high in Alphen aan den Rijn, so they now have new parking standards based on car ownership.”* This makes it clear that both parking standards and car ownership are high in Alphen aan den Rijn. The parking standard has recently been adjusted to the actual car ownership among residents. However, this means that there are sufficient parking options in the public space for every car owner. This means that people find alternative forms of mobility less attractive. This also applies to shared mobility. Owning your own car makes the use of a shared car less attractive. However, the situation can also be reversed. When there is a low parking standard in a city, there are therefore few parking options. Parking a vehicle thus becomes more difficult for people, which affects the attractiveness of using the car. This makes alternative forms of mobility more attractive, including shared mobility. According to Jorissen (personal communication, 29-04-2021), when car ownership is hindered by, for example, few parking options or high parking costs, the demand for shared cars and shared scooters increases. De Bos emphasizes this in the following way: *“The moment you as a parking company, or I as a parking policy officer, would be much more restrictive with the supply of parking spaces, or the price of parking spaces, I am an absolute driver of shared mobility. in the city”*. De Bos makes it clear here that with parking policy you are indirectly influencing the supply of shared mobility in the city. This is because the demand for shared mobility influences the supply of shared mobility in a city. After all, when there is a demand for shared mobility, the supply will increase due to market forces. So, in this case we see that parking policy through nudging is able to influence people's travel behavior, as stated by McShane & Meyer (1982).

A final example of nudging in parking policy that influences people's travel behavior, and thus the use of shared mobility, is parking costs. As a municipality, the rates for parking the car can be regulated. Bos (personal communication, 15-04-2021) describes this as follows: *“What we do is we manage the availability and price of parking spaces. And if that leads to people changing their behavior, then fine.”* He adds: *“We control the ease with which people can park the car, whether they own or not, somewhere for a price they are willing to pay for it. And if the result of availability or price is that they don't buy that car, then I think that's more than fine”*. Here the role of parking policy in people's travel behavior becomes even more clear. Municipalities are able to link certain rates to parking, which influences people's mobility choices. In this situation too, the following applies: when parking is expensive, car

ownership is less attractive and users are more likely to look at alternative forms of mobility, including shared mobility. This affects users' choice to use shared mobility, thereby influencing behavior.

#### 5.4.2 Nudging with shared mobility

We therefore see that nudging is used in parking policy to change people's behavior. When we look at shared mobility, it is striking that nudging is used here as well. Earlier, the example was given of making shared mobility visually present as a form of nudging so that people's behavior is influenced. We see in this case that the presence of shared mobility itself is what causes the change in people's behavior. It can therefore be stated that shared mobility is a form of nudging itself. We see that the providers of shared mobility try to change people's behavior by using forms of nudging. To explain the fact that shared mobility is a form of nudging itself, some practical examples from the investigated cases will be given below.

On the shared car platform SnappCar, lessors of shared cars are trying to increase the awareness of the vehicles among residents (Dorrestein, personal communication, 04-05-2021). This is done by sticking stickers on the shared cars to increase visibility among potential users. At the car-sharing provider MyWheels, they mainly look at strategically visible locations to place the vehicles. Herber (personal communication, 30-04-2021) explains the following about this: *"We want to look for good visible places. To places where there is a lot of movement. Where people will really come across the car in a natural way and maybe then become interested"*. By placing the shared car in a visible location, an attempt is made to induce a change in people's choice of travel mode. This is a perfect example of nudging in which a subtle change in people's environments leads to a change of the context in which people make choices (Marteau et al., 2011).

However, we see that the visual presence of shared mobility in public space can also have a negative effect. Wijnants (personal communication, 29-04-2021), who works for shared scooter provider Felyx, has the following to say about this: *"...[O]ur scooters, they all look the same. They are recognizable as being from a private company. And in that sense, they are more likely to be seen as a nuisance."* Wijnants is referring here to the fact that the shared scooters all have the same external characteristics, as a result of which people experience the shared scooters as very present in the street scene. According to Wijnants, this sometimes leads to negative associations with shared mobility among residents. This example illustrates that steering in the visual presence of shared mobility in public space, in this case a form of nudging, can sometimes also lead to negative awareness. So, there are also cases in which nudging leads to an unintended change in people's behavior.

#### 5.4.3 Influence of behavior

It has become clear that both parking policy and shared mobility use nudging to influence people's behavior. In parking policy, the policy interventions are used to achieve this change in behavior. Shared mobility, on the other hand, is a form of nudging itself. One's own presence can change people's behavior. When we think a step further, we see that people's behavior influences parking policy and shared mobility, and thus the relationship between the two.

In section 5.3 it became clear that shared mobility is influenced by its use. When offering shared mobility by providers, the expected use and where potential customers are located is being looked at. An attempt is made to offer shared mobility where there is a demand for shared mobility or where potential users are located. Shared mobility depends on the demand for the product, in other words there is a market mechanism. So, when there is a demand for shared mobility, providers of shared mobility will offer their vehicles. If people make little use of shared mobility, providers will reduce the offer of shared mobility. It thus becomes clear that people's behavior influences the choice for a travel mode, and thus the supply and demand of shared mobility.

In addition, we see that parking policy is influenced by people's behavior. This can be explained on the basis of the policy cycle of Jann & Wegrich (2007), in which the agenda setting phase is particularly important in this case. Agenda setting has been explained by Birkland (2007) as the process in which problems and alternative solutions do or do not receive public and elite attention. In a situation where a change in people's behavior leads to more use of shared mobility, a change in public space takes place. Because the presence of shared mobility in public space requires regulation on the basis of policy, it is placed on the political agenda. Cobb (1976) previously indicated that the political agenda can be considered as the set of problems that is prioritized by political and administrative authorities. This is confirmed by the fact that municipalities respond to the (potential) problems that arise from shared mobility and want to keep control on public space. This is why public policy is a reflection of the problems that play a role in our society. It thus becomes clear that people's behavior has an influence on both parking policy and shared mobility. This behavior also influences the relationship between parking policy and shared mobility.

## 5.5 Conclusion

In this chapter, the relationship between parking policy and shared mobility is discussed on the basis of a multiple case study. Four medium-large cities in the Netherlands were investigated in which respondents employed by municipalities and shared mobility providers were interviewed. On the basis of the conceptual model (Figure 6) an attempt is made to explain the relationship between parking policy and shared mobility.

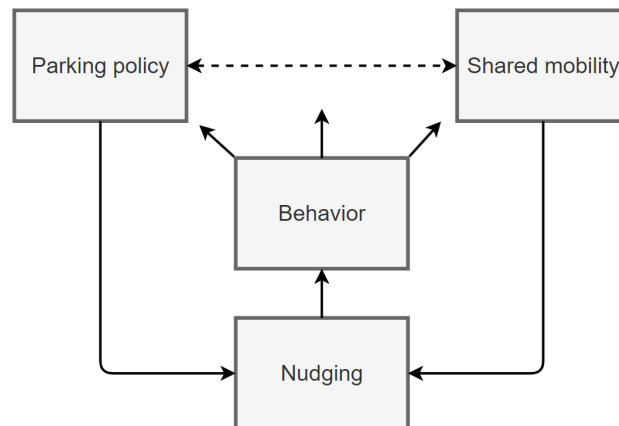


Figure 6: Conceptual framework

When looking at the direct interaction between parking policy and shared mobility, it turns out that the presence of one influences the presence of the other. When shared mobility makes its entrance in a city, we see that municipalities respond to this by drawing up policy. This is mainly done to maintain a grip on the public space. At the same time, changing the parking policy affects the choice of providers to offer shared mobility, and thus the presence of shared mobility in the city. So, it becomes clear that when one changes, the other changes as well. It can therefore be concluded that parking policy and shared mobility operate in a feedback circle in which they continuously influence each other.

Parking policy and shared mobility use nudging to influence people's behavior. In parking policy, the policy interventions are used to achieve this change in behavior. Shared mobility, on the other hand, is a form of nudging itself because one's own presence can change people's behavior. People's behavior then has an effect on parking policy and shared mobility. This can be explained on the basis of the principle of market forces and the policy cycle in which agenda setting plays an important role. People's behavior influences the demand for shared mobility, that which influences the supply of shared mobility through market forces. The behavior therefore also has an influence on parking policy because policy is a reflection of the problems that play a role in our society. This also applies to shared mobility where use can also lead to problems in public space. It can be concluded that parking policy and shared mobility use forms of nudging to change behavior, which in turn influences shared mobility and parking policy.

The underlying reason why parking policy and shared mobility use nudging to change people's behavior can largely be explained by the phenomenon of densification. After all, we see that parking policy is trying to find an answer to the densification challenge in cities. By applying a parking policy that encourages shared mobility, an attempt is made to contribute to the densification task by influencing people's behavior. Densification can therefore also be seen as the driving force in medium-large cities in the Netherlands to change people's behavior with parking policy and shared mobility.

## 6. The case of Arnhem

The final stage of this research concerns the treatment of the Arnhem case. In this part of the research, we will try to answer the question: *'Which aspects must be taken into account, for the municipality of Arnhem, when including shared mobility in their parking policy in order to achieve the goals?'* To answer this question, a case description will first be elaborated on in which various aspects about Arnhem are being discussed. For example, the parking policy applied, the environmental vision, the available shared mobility and the densification challenge are discussed. The aspects that the municipality of Arnhem must take into account when including shared mobility in their parking policy will then be explained. The connection will be made with the theory in this research, and this will be placed in the context of the policy goals in the parking policy of the municipality of Arnhem.

### 6.1 Case description

Arnhem is a city and municipality in the east of the Netherlands and the capital of the province of Gelderland. The municipality has 162,477 inhabitants as of January 1, 2021, making it the thirteenth municipality in the Netherlands. The city has no university and therefore has fewer students living in the city than previously discussed cities such as Groningen, Nijmegen and Eindhoven. Students are generally characterized by high bicycle use and low car use and ownership. According to Bulsink (personal communication, 31-05-2021), this is one of the reasons that Arnhem often has a higher car use and possession compared to other cities. The presence of relief in the city also contributes to the fact that residents in Arnhem are always very 'car minded'. The latter influence has become a less important factor in this for a few years now, because electric bicycles and scooters have made their appearance in our society, and so relief is less of an obstacle. Because the car is a widely used and attractive form of mobility in Arnhem, the use and awareness of shared mobility among residents appears to be limited. Residents seem to meet their mobility needs for the time being. In addition, the policy of the Municipality of Arnhem has not yet paid much attention to shared mobility. *"Until now, we have not put shared mobility on the map, and we are working on it now. We don't have the policy yet, we haven't rolled out the red carpet yet"* (Bulsink, personal communication, 31-05-2021). So far, shared mobility has not been strongly promoted with the policy of the Municipality of Arnhem. This, in combination with the high car use and ownership in Arnhem, are two things that together ensure that the awareness and use of shared mobility among residents is not yet so great. The fact that the policy of the Municipality of Arnhem has not yet focused on promoting shared mobility is partly due to political influences.

In order to understand these political influences and certain motives in the policy of the municipality of Arnhem, it is important to provide some political context. After all, it became clear earlier in the policy cycle of Jann & Wegrich (2007) that agenda-setting is the first phase in public policy, which is directly influenced by what is on the political agenda. The problems that can be considered as priorities by political and administrative authorities, together form the political agenda (Cobb, 1976). It is for this reason that public policy is strongly influenced by political and administrative authorities. Similarly, the policy of the Municipality of Arnhem is a direct result of political choices. The municipality of Arnhem now has a broad coalition. The coalition negotiations after the 2018 municipal elections have resulted in a 2018-2022 coalition agreement drawn up by GroenLinks, VVD, PvdA and D66. GroenLinks and VVD are the largest parties in this coalition. In general, the positions of these two parties are quite different. GroenLinks is a Dutch political party with a progressive-left character, while VVD (The People's Party for Freedom and Democracy) is characterized by its liberal character. Because the political positions are sometimes far apart, a compromise often has to be made. This often results in policies that do not cause major changes. We see this, for example, in the requirement if shared mobility should be only electric or not. If it is up to GroenLinks, the requirement for shared mobility will be that it is also electric, so that two steps are taken at the same time. However, the VVD wishes to realize shared mobility first, and to demand that it be electric at the same time is too far (Bulsink, personal



communication, 31-05-2021). There is something to be said for both and for both there is something to argue against. Bulsink (personal communication, 31-05-2021): *"GroenLinks says: 'Then you only reach half of it.', and the other says: 'Then you might not achieve anything at all, because then we won't get any suppliers'.* This situation paints a perfect picture of the influence of politics on the policy process. The fact that public policy is strongly influenced by political and administrative authorities should therefore certainly be taken into account.

With the political context in mind, the current policy of the municipality of Arnhem can be discussed. A preliminary draft of the Arnhem 2040 environmental vision was published in May 2021. This made clear, among other things, the vision and ambitions regarding parking and shared mobility. One of the ambitions that emerges in the 'Preliminary Design Environmental Vision Arnhem 2040' is the following:

*We are developing an integrated parking strategy for the center and the surrounding neighborhoods, which is based on a lower parking standard in combination with a fair form of paid and licensed parking. The aim is to reduce the pressure on public space.*

What is immediately noticeable is the use of certain policy interventions with a lower parking standard and the use of parking fees and permits. The associated objective is to reduce the pressure on public space. As we saw in the previous chapter in the multiple case study, almost every medium-large city in the Netherlands has a densification challenge. This is also the case in Arnhem. Bulsink (personal communication, 31-05-2021) states the following: *"About 16,000 homes need to be added in existing neighborhoods. (...) We are no longer going to build new residential areas on the edges of the city, the Vinex districts".* This is not done, among other things, because these neighborhoods are somewhat remote from facilities, which means that car dependence, and therefore car use, increases. This means that these homes must be built in existing residential areas and other available sites in the city. This ensures that major densification will take place when these homes are realized. We therefore see that dealing with the densification task is also clearly reflected as an objective in the preliminary design of the 'omgevingsvisie':

*We make optimal use of the scarce space in and around the center through a smart densification strategy.*

The parking policy of the municipality of Arnhem is an important part of this. The parking policy should not hinder these developments by, for example, applying excessively high parking standards. Not getting in the way is one thing, but according to the environmental vision, the parking policy should also contribute to the densification task. By applying lower parking standards in combination with regulation, the parking policy should contribute to a solution for the issues related to densification. However, in the current parking policy, the parking standard appears to have been adapted to the demand for parking space. Bulsink (personal communication, 31-05-2021) indicates that the future policy will have a more guiding character, whereby *"...parking policy can also help to reduce car mobility"*. By applying lower 'steering' parking standards, an attempt is made to change car ownership among residents.

However, we see that it is not only the lower parking standards and regulations that should contribute to the densification challenge, shared mobility is also seen as a solution here:

*Furthermore, we invest in hubs and facilitate shared car use and electric charging. In the long run, these developments may mean that fewer parking spaces are needed. Fewer parking spaces means more space for things like greenery, meeting and exercise.*

This makes it clear that it is the ambition of the municipality of Arnhem to facilitate and stimulate shared mobility, in order to meet the objectives related to densification and sustainability. Several forms of shared mobility are already available in Arnhem. The commercial providers of shared cars that are

active in the city of Arnhem are Greenwheels, MyWheels, Amber and We Drive Solar. Most of these companies' shared cars are station-based or free-floating. There is also private car sharing via the SnappCar platform, where private individuals can share their own car with other people. Since 2020, an e-Hubs project has been started in Arnhem in which three hubs have been placed in the city where shared cars and shared bicycles are offered. The municipality of Arnhem has taken the initiative in this project itself and has therefore also started to give these hubs a location in the city. The municipality of Arnhem therefore does not want to leave the presence of shared mobility in the city only to the market, but also wants to take an active initiative to realize shared mobility. There are also the public transport bicycles of the Nederlandse Spoorwegen, which serve as widely used shared bicycles in Arnhem. So, we see that carsharing and bike sharing have been the present forms of shared mobility in Arnhem until now. Shared scooters are not present, but they are probably making their entrance in the future. Swart (personal communication, 08-06-2021) says the following about this: *"We also have scooters in our [conceptual] policy, so we want to experiment with that too. And scooter steps too, but with a lot of customization"*. Furthermore, Swart (personal communication, 08-06-2021) indicates that the municipality of Arnhem has also been approached several times by providers of shared scooters with the request to be allowed to offer them in the city. This shows that the share of shared mobility in the city is still growing and that providers would like to enter the streets of Arnhem. However, there is a desire from the municipality to first draw up a concrete policy on shared mobility before providers of shared mobility are allowed into the city on a large scale.

## 6.2 Stimulating shared mobility with parking policy in Arnhem

It has become clear what the objectives in Arnhem's policy entail. It appears that the densification challenge is an important motive in the policy of the municipality of Arnhem, which means that a lowering of the parking standards is the wish, and perhaps even a necessity. The environmental vision has also shown that shared mobility can play an important role in lowering parking standards and achieving the policy objectives. However, in order to stimulate shared mobility with the help of the parking policy, a number of things must be taken into account. In this section the most important aspects will be discussed, which the municipality of Arnhem must take into account when including shared mobility in their parking policy in order to achieve the goals.

### ❖ Increase awareness among residents

As has become clear several times in this study, shared mobility is often still a new concept that not all people are familiar with. Stimulating and realizing shared mobility therefore also strongly depends on people's awareness of the concept of shared mobility. After all, when awareness is low, usage will also be low. Stimulating and realizing shared mobility should therefore go hand in hand with creating more awareness among residents and potential users. Commercial providers of shared mobility naturally have an important role to play in this. After all, they benefit from higher awareness, which results in more use and more profit. However, since municipalities also benefit from a higher degree of use of shared mobility, they also benefit from a high level of awareness of shared mobility among its residents. We therefore see that it is not only up to the commercial parties, but there is also a role for the municipality to increase awareness of shared mobility. This requires a good approach. In this study, the concept of nudging has been discussed several times in which people with subtle changes are unnoticeably stimulated to adjust their unconscious behavior. However, when raising awareness of shared mobility, consciously and actively informing and encouraging people is a useful way of achieving this. Herber (personal communication, 30-04-2021), who works at MyWheels, gave a good example of this in Eindhoven, where the municipality actively approached residents with the arrival of shared cars. The concept of car-sharing was explained and residents were introduced to the provider. Jorissen gave another good example (personal communication, 29-04-2021): *"You also see in municipalities that when young people have obtained their driver's license, municipalities then indicate: 'you have obtained your driver's license, you might want to take a look at the option of shared mobility'"*. In this way, a target

group is approached which could potentially be an important user of shared mobility. Especially in view of the fact that this target group is often faced with the choice of whether or not to purchase their own car. Creating awareness among residents at the right time is therefore an essential aspect for stimulating shared mobility. You therefore do not only stimulate shared mobility by placing shared vehicles in the street, but also by increasing awareness among residents.

#### ❖ Preventing escapism

Another aspect to take into account when promoting shared mobility through parking policies is escapism. In the theoretical framework, this phenomenon has been elucidated by Verhoef et al. (1996) as a situation in which parkers divert to surrounding areas where a different parking policy applies. In such a case there is the danger of a considerable shift of the "parking burden" from the strictly enforced place onto the surrounding area. This may concern, for example, paid parking or the lack of sufficient parking spaces due to a low parking standard. If there is a possibility in the vicinity to circumvent these barriers, and therefore to be able to park for free for example, then the parking burden will move to this area. According to Bulsink (personal communication, 31-05-2021), there is also a shift of the parking burden in some areas in Arnhem, whereby car users bypass regulation in a specific area. This can have a direct influence on the attractiveness of shared mobility. After all, in chapter 5 it became clear that when car ownership and use are attractive due to, for example, sufficient parking options or low costs, alternative forms of mobility (including shared mobility) are less attractive. The theory of habitual behavior can partly explain this situation. It turns out that the choice for a travel mode may be perceived as not only a rational process, but also originating from habitual behavior (Thøgersen & Møller, 2008). When people have automaticity in their travel mode choice, this has consequences for behavior in the future. In the case of escapism, this automaticity of habitual behavior appears to play a role in the consequences for behavior of people. Car users have the option of circumventing restrictions, such as paid parking or applying for a permit. This makes it unnecessary and less attractive for users to use alternatives, such as shared mobility. In this case, we see that users remain stuck in their old pattern of mobility because of their habitual behavior. To break this pattern, there should be no escape options from restrictions in an area. We see here that the scale on which parking policies are applied is important in order to prevent escapism in a specific area. Applying a restrictive policy in one district, but not implementing this policy in the neighboring district, can lead to a shift of the parking burden, which can hinder the success of shared mobility. Escapism should therefore be prevented as much as possible in the parking policy of the Municipality of Arnhem.

#### ❖ Transparent communication with providers

An important aspect where shared mobility and parking policy come together is the communication between the actors involved. Communication should be as transparent as possible at all times between the actors involved, such as municipalities and providers of shared mobility. This concerns, for example, the municipality informing providers about the policy applied and possible future changes in this. Also processing applications can sometimes encounter difficult communication. For example, Jorissen (personal communication, 29-04-2021), who works at Greenwheels, indicated that it can sometimes take six months to a year before an application is processed. Jorissen (personal communication, 29-04-2021): *"I think that is sometimes a missed opportunity. Because people want it and if you don't put it there, they'll just buy a car or look for something else."* By communicating faster and more transparently, opportunities can be prevented from being missed, for example to prevent the purchase of your own car with shared mobility. However, communication between actors can also go further. Consider, for example, the inclusion of the wishes of providers in the parking policy of the municipality. In this way, multiple perspectives are included in the formulation of parking policy. However, it must be taken into account that the providers of shared mobility are often commercial parties with a profit motive. The objectives of these commercial providers usually do not correspond to the objectives of a municipality. Therefore, these parties should always be treated with care. De Bos (personal

communication, 15-04-2021) has the following to say about this: *“Ultimately, it is market parties that operate in your public space. (...) In the end you see that they are just hard commercial parties that make money from something that is essentially not theirs. So, I wholeheartedly welcome shared mobility, but I always argue in favor of looking at it somewhat critically.”* For this reason, a municipality sometimes has to be a little more cautious and reserved with regard to commercial providers of shared mobility. However, this degree of being restrictive should not stand in the way of the opportunities for shared mobility. It is therefore important that municipalities find a good balance in their parking policy. On the one hand, adopt a restrictive policy so that the public space remains in good order. On the other hand, providers of shared mobility should not be too limited in their options by the parking policy. This balance between restrictive and facilitating/stimulating action by municipalities in parking policy must be carefully considered.

#### ❖ Distinction between commercial and private sharing

A final aspect to take into account when incorporating shared mobility into parking policy is the distinction between commercial and private sharing. Shared mobility is not only offered by commercial parties, but can also be realized by private individuals. For example, an advantage of private sharing compared to commercial sharing is the fact that no new vehicles have to be placed in public space. For example, in the case of private car sharing, residents use their own car to make car sharing possible. Offering the private car for car sharing can be done verbally, but there are also platforms such as SnappCar where providers and users are brought together. During the research it became clear that municipalities often have insufficient knowledge about private car sharing in the municipalities. In the municipality of Arnhem, too, there appears to be little insight into private car sharing in the city (Swart, personal communication, 08-06-2021). Moreover, many municipalities find it difficult to include peer-to-peer car sharing in their policy. This is apparent in the first place from the fact that the desk research in Chapter 4 shows that many municipalities have included commercial sharing in the parking policy, but not private sharing. In only a small part of the medium-large cities in the Netherlands, there is a policy on private sharing in the parking policy. Dorrestein (personal communication, 04-05-2021), who works at SnappCar, knows how to give a good example of a parking policy that only includes commercial sharing, but not private sharing. *“We have car sharers who would come very close to a commercial provider in terms of rental occupancy. However, they are not eligible for a permanent parking space because they are not a company, but private. Of which we say: it is about the use of that shared car. Whether that is a red Greenwheels or another car, in principle it should not matter”* (Dorrestein, personal communication, 04-05-2021). In this case, we see that municipalities have incentives that are only aimed at commercial sharing. As a result, private individuals are not eligible for some measures that commercial providers can claim. By applying a parking policy in which both commercial and private sharing are discussed, no forms of shared mobility are excluded. In this way, the potential of shared mobility can be optimally utilized. In addition, having sufficient knowledge about private sharing in the municipality is an important requirement for including private sharing in the parking policy.

### 6.3 Conclusion

The aim of the parking policy in Arnhem is mainly focused at a good match with the demand for parking space. However, it has become clear in the *Omgevingsvisie* of the Municipality of Arnhem that reducing the pressure on public space in connection with densification is an important objective for the Municipality of Arnhem. This will be translated into the parking policy in which shared mobility will be encouraged in order to reduce the pressure on public space. In order to integrate shared mobility into the parking policy of the Municipality of Arnhem, a number of aspects must be taken into account. First of all, parking policy must take into account forms of escapism that can hinder the success of shared mobility. In addition, the policy should not only focus on commercial sharing, but also on private sharing. In this way, no forms of shared mobility are excluded in the parking policy. Transparent communication with providers of shared mobility and including their wishes in the formulation of policy is also desirable. It is important to find a good balance between restrictive action on the one hand and facilitating and stimulating action by municipalities towards providers on the other. When including shared mobility in the parking policy of Arnhem, these aspects must be taken into account in order to achieve the ultimate objectives of the parking policy.

However, it should be noted that shared mobility is not the only factor in parking policy that contributes to achieving the policy's objectives. The recommendations pointed out are largely discussed from the perspective of stimulating shared mobility only. In order to achieve the objectives in the parking policy, such as dealing with densification, the parking policy will have to be looked at more broadly than just the shared mobility component.

## 7. Conclusion and discussion

### 7.1 Conclusion

In this research, an attempt was made to answer the main question in this research by means of a multiple-case study: *To what extent can the parking policy of medium-large cities in the Netherlands influence the role of shared mobility in the city, and how can this contribute to the goals of parking policy in Arnhem?*, and the associated sub questions. The aim of this study was to gain insight into the extent to which shared mobility is influenced by parking policy in medium-large cities in the Netherlands, and what lessons can be learned for the city of Arnhem to influence shared mobility with parking policy. This allows municipalities to make better policy choices in their parking policy on the basis of this research regarding the management of shared mobility in the municipalities. Subsequently, this understanding contributes to the aim of improving spatial design and land use, which complement accessibility and travel behavior in and around the city. In this research, special attention was given to the case of Arnhem in order to make it possible to zoom in more deeply on a specific case. Doing research into the case of Arnhem has resulted in recommendations regarding the aspects which the municipality of Arnhem should take into account when including shared mobility in their parking policy.

First of all, research was conducted on how municipalities incorporate shared mobility in their parking policy. This was done by examining the parking policy regarding shared mobility of 15 medium-large cities in the Netherlands in the form of a desk research. During the study, several aspects of the parking policy regarding shared mobility were highlighted. It became clear that the role of bike and scooter sharing in parking policy lags behind that of carsharing. In addition, the majority of municipalities only focus on commercial shared mobility providers, and not on the private side or shared mobility. The role of municipalities in relation to shared mobility in parking policy has also been investigated. In general, a distinction can be made between facilitating shared mobility on the one hand and actively encouraging shared mobility on the other. It is striking that almost all municipalities play a facilitating role in the study, while an active role in stimulating shared mobility is less common. In the municipalities where an active role in stimulating shared mobility has been taken, extra measures are often taken to realize shared mobility, such as offering a discount on the parking permit for shared cars. Finally, it appears that the majority of the municipalities surveyed offer an opportunity to lower the parking standard if shared mobility is realized by a project developer.

Secondly, it was investigated to what extent parking policy and shared mobility influence each other. To explain the relationship between parking policy and shared mobility on the basis of theory, theories concerning human behavior and influence have played an important role in this research. Nudging and behavior have been included in the conceptual model to explain the relationship between parking policy and shared mobility. This relationship was investigated by means of a multiple-case study. Four medium-large cities in the Netherlands were examined in which respondents working for municipalities and providers of shared mobility were interviewed.

In the beginning, the direct interaction between parking policy and shared mobility was discussed. It turned out that the presence of one influences the presence of the other. When shared mobility makes its entrance in a city, we see that municipalities respond to this by drawing up policy. At the same time, changing the parking policy affects the choice of providers to offer shared mobility, and thus the presence of shared mobility in the city. We see that parking policy and shared mobility operate in a feedback circle in which they continuously influence each other.

Subsequently, an attempt was made to explain the relationship between parking policy and shared mobility on the basis of nudging and behavior. The results have shown that parking policy and shared mobility both use nudging to influence people's behavior. Nudging can be seen as introducing subtle changes in people's environments, changing the context in which people make choices in order to

influence behavior (Marteau et al., 2011). According to Thaler & Sunstein (2008), however, nudging is about influencing the unconscious behavior of people. This study therefore not only looked into the Theory of Planned Behavior and the Reasoned Action Approach by Azjen (1991), but also theories about our unconscious (habitual) behavior. It turned out that changes in our behavior through certain policies often affect our unconscious behavior. In parking policy, policy interventions are used for this to bring about this change in unconscious behavior (McShane & Meyer, 1982; Shiftan & Burd-Eden, 2001). Municipalities use various policy interventions for this, such as offering a discount on the parking costs for shared vehicles. Shared mobility on the other hand, is a form of nudging itself because its own presence can change people's behavior. For example, both municipalities and providers of shared mobility respond to the visibility of shared mobility in order to influence the behavior of (potential) users. This can be seen as a typical case of nudging in which subtle changes in the 'context of choice' influence people's unconscious behavior. Taking the foregoing into account, it can be concluded that parking policies and shared mobility use nudging to influence people's unconscious behavior.

Furthermore, the effect of this change in people's behavior through nudging was used to explain the relationship between parking policy and shared mobility. The research has shown that people's behavior has an effect on parking policy and shared mobility. After all, people's behavior influences the demand for shared mobility, which influences the supply of shared mobility through market forces. The behavior, therefore, also has an influence on parking policy. After all, on the basis of the policy cycle of Jann & Wegrich (2007) it has become clear that policy is a reflection of the problems that play a role in our society, which arise through human behavior. The results of the study confirm this due to the fact that parking policies are a direct response to people's actions. This does not only concern parking, but is also extended to themes such as use of space, sustainability and climate. Therefore, medium-large cities in the Netherlands respond to the behavior of its inhabitants with their parking policy. It turns out that parking policy and shared mobility influence people's behavior, but that this behavior in itself also influences parking policy and shared mobility, and thus the relationship between the two. This interdependency completes the circle in the conceptual model. This means that the conceptual model, which is based on the discussed theories, can be broadly confirmed. It should also be noted that parking policy, shared mobility and behavior can be influenced by many external factors. Think for example of land use in the city, education level and age of the population and economic situation. Therefore, the conceptual model in this study is not a stand-alone model without outside influences. However, this does not change the fact that, based on the results mentioned above, this research has made a contribution to the discussed theories regarding behavior and influence in relation to parking policy and shared mobility.

This brings us to the answer to the main question that is central to this research. It appears that the parking policy of medium-large cities in the Netherlands can indeed influence the role of shared mobility in the city. We see that this takes place during three phases in the realization of shared mobility.

#### ❖ Business climate

First of all, parking policy has an effect on important factors in the city such as the use of space, densification, mobility and the travel behavior of residents. As a result, the parking policy influences the business climate for shared mobility in a city. These factors are influenced by policy interventions such as parking standards and parking rates. When car ownership is less attractive due to limited parking space and high costs, people will start looking for alternatives. Shared mobility is one of the alternatives that becomes more attractive when car ownership is not. We therefore see that parking policy has an effect on people's travel behavior and indirectly influences shared mobility.

#### ❖ Accession of shared mobility

We then see that the parking policy has a direct effect on the possibility for shared mobility providers to offer, or not to offer, shared mobility in the city. Using permits for shared mobility ensures that



municipalities have a large degree of control over shared mobility in their own city. Municipalities have the power to exclude providers of shared mobility from the city. At the same time, they can actively request specific forms of shared mobility for which they can issue permits. Therefore, it appears that municipalities have a great deal of influence on the entry of shared mobility in a city.

#### ❖ Realization of shared mobility

The parking policy also influences the placement of shared mobility in public space. The designation of fixed locations for shared vehicles by municipalities has a major influence on the presence and use of shared mobility in the city. After all, it became clear earlier that the visibility of shared mobility can have an important influence on people's travel behavior. The visibility of a shared vehicle is closely related to its use. Therefore, we see that here too the parking policy of medium-large cities influences shared mobility in the city.

This brings us to the last part of the main question concerning the case of Arnhem. It has been examined which aspects must be taken into account by the municipality of Arnhem, when including shared mobility in their parking policy in order to achieve the goals. This was done by conducting a document-analysis and conducting interviews with policy officers of the municipality of Arnhem. It seems that the aim of the parking policy in Arnhem is mainly focused on a good match with the demand for parking space. However, it becomes clear in the *'Omgevingsvisie'* of the Municipality of Arnhem that reducing the pressure on public space in connection with densification is an important objective for the Municipality of Arnhem. This will be translated into the parking policy in which shared mobility will be encouraged in order to reduce the pressure on public space. In order to integrate shared mobility into the parking policy of the Municipality of Arnhem, a number of aspects must be taken into account. Parking policy must take into account forms of escapism that can hinder the success of shared mobility. In addition, the policy should not only focus on commercial sharing, but also on private sharing. In this way, no forms of shared mobility are excluded in the parking policy. Transparent communication with providers of shared mobility and including their wishes in the formulation of policy is also desirable. It is important to find a good balance between restrictive action on the one hand and facilitating and stimulating action by municipalities towards providers on the other. When including shared mobility in the parking policy of Arnhem, these aspects must be taken into account in order to achieve the ultimate objectives of the parking policy. Moreover, this understanding contributes to the aim of improving spatial design and land use, which complement accessibility and travel behavior in and around the city of Arnhem.

## 7.2 Discussion

Now that the research question has been answered, this last section offers a critical reflection on the implications, limitations and recommendations of the research.

### 7.2.1 Implications

This research has proven to be valuable in various ways. In the problem statement, the need for this research was recognized. This resulted in a research aim in which gaining insight into the extent to which shared mobility is influenced by parking policy in medium-large cities in the Netherlands was central. It is now clear to what extent parking policy of medium-large cities in the Netherlands influences the role of shared mobility in the city, and how this contributes to the goals of parking policy in Arnhem. By having a better understanding of the effects of parking policy on shared mobility, municipalities now have more knowledge of the effects of their own policy on shared mobility in the city. This should make decision-making and the associated considerations easier and more transparent for the actors involved in future situations. Moreover, the results also offer points of departure for municipalities to influence shared mobility in a better way on the basis of parking policy. This is not just about gaining insight into the degree of influence of parking policy on shared mobility, but rather the ability to actually influence shared mobility through parking policy. Using multiple cases, it has become clear which aspects must be taken into account when trying to influence shared mobility with parking policy. This allows municipalities to contribute to the improvement of spatial design and land use, which complement accessibility and travel behavior in and around the city.

Furthermore, this research is discussed regarding to have contributed to the literature. It was previously acknowledged that a fair amount of research has been written about shared mobility (Frenken, 2015; Shaheen et al., 2015; Katzev, 2003) and parking policy (McShane & Meyer, 1982; Shiftan & Burd-Eden, 2001; Verhoef et al., 1996). However, there appeared to be a knowledge gap in the literature regarding the relationship between the two concepts. Because the results of this research have provided more insight into this relationship, an important contribution has been made to the development of theories about parking policy and shared mobility. Additionally, theories about nudging and behavior have played an important role in this research. The results of the study concluded how parking policies and shared mobility use nudging to influence people's unconscious behavior. Moreover, it was found to what extent parking policy and shared mobility influence people's behavior, but that this behavior itself also influences parking policy and shared mobility, and thus the relationship between the two. By providing more insight into the influences of nudging and behavior on parking policy and shared mobility, this research also contributed to the existing literature regarding these concepts.

### 7.2.2 Limitations

The research has known some limitations which have influenced the process. Firstly, this concerns the limitations of a conceptual model that has been the guiding principle in this research. In the conclusion, it was briefly stated that the conceptual model in this study is not a stand-alone model without outside influences. Parking policy, shared mobility and behavior can be influenced by many external factors. An example of this is the fact that policy is highly dependent on the political context. It was not possible in the study to include all political influences in the results. This is an example of an external factor that could influence the results of the study. It must therefore be taken into account that external influences have had their effect on the results, without always being able to take this into account.

The above-mentioned aspects are also related to the generalizability of the results obtained from the case studies. During the research, several cases were investigated. A multiple case study has been conducted with 4 cities and additionally the case of Arnhem. This number of cases was chosen so that in-depth research is possible, but, nevertheless, there is a multiple case study in which contextual influences are reduced. This is because each case is a *"...complex entity located in its own situation..."*, with special contexts and backgrounds (Stake, 2013). Using a multi-case study results in some of these contextual influences being illuminated. However, despite examining several cases, it cannot be

avoided that some contextual influences have had a major impact on the research. On the one hand, these influences are relevant to the research because they make the case a 'complex entity located in its own situation'. On the other hand, this slightly reduces the degree of generalizability of the research. The methodology has shown that this has been prevented as much as possible by, among other things, deliberately choosing a multiple case study. In retrospect, however, it must be concluded that investigating even more cases would have been desirable so that the contextual influences have less effect on the generalizability of the results. However, due to limited time available for the research, this would be at the expense of the extent to which in-depth research was possible per case.

The influence of parking policy on the behavior of users of shared mobility played a role in the study. This influence has been investigated on the basis of existing literature and interviews with policy makers and providers of shared mobility. However, to examine the effect of policies on user behavior, it would also be useful to examine this among users themselves. In this study, however, it was decided not to include the user as respondent in the study because it was not the influence of parking policy on behavior, but the influence of parking policy on shared mobility that was central to this study. Therefore, a consideration was made between researching different target groups. It was concluded that policy makers and providers of shared mobility were the most suitable target groups for this study. Investigating the effect of parking policy on behavior in which users of shared mobility are questioned could be a research on its own.

### 7.2.3 Recommendations

The results of the research have led to several recommendations. A distinction has been made between recommendations for situations in practice and recommendations for further research.

#### Recommendations for practice

In the chapters about the results of the study and in the conclusion, some recommendations have already been given for practice. For example, in the chapter on the case of Arnhem, several recommendations have been made about how parking policy can influence shared mobility in the city. These recommendations do not only apply specifically to the city of Arnhem, but can also be applied to other medium-large cities in the Netherlands. The recommendations are summarized below.

- Parking policy must take into account forms of escapism that can hinder the success of shared mobility.
- Parking policy should not only focus on commercial sharing, but also on private sharing. In this way, no forms of shared mobility are excluded in the parking policy.
- Transparent communication with providers of shared mobility and including their wishes in the formulation of policy.
- It is important to find a good balance between restrictive action on the one hand and facilitating and stimulating action by municipalities towards providers on the other.

In addition, there are several other recommendations arising from this research. Firstly, when stimulating shared mobility, municipalities must always consider what goal they want to achieve with it. It is also necessary to consider the effects of the presence of shared mobility. If the realization of a shared scooter results in people walking or cycling less, this can be an undesirable consequence of the realization of shared mobility. This is why it should always be taken into account what you want to achieve as a municipality by stimulating shared mobility.

Another important recommendation that can be made on the basis of this research concerns the fact that the effects of shared mobility are often long-term. In the problem statement, for example, it became clear that a shared car is capable of replacing on average four to ten private vehicles (Shaheen, 2007). This was confirmed during the research, but it became clear that this could take some time. Initially, when installing a shared car, the idea among many residents and policymakers is that an extra car is

added into the street. However, in this case, it should always be kept in mind that in the long term this can lead to a decline in car ownership, causing other cars to disappear from the streets.

#### Recommendations for research

In further research, firstly, research can be done in the longer term with multiple measurements in time. This makes it possible to investigate the effects of parking policy on shared mobility in the long term and to observe changes. Longitudinal research should therefore be carried out, which means that several measurements are taken over a longer period of time (Van Thiel, 2014). In this study, the results are based on a single measurement in time for every case, which means that the long-term effects of parking policy on shared mobility have hardly been discussed. In the previous section, however, it became clear that the effects of parking policy and shared mobility often occur in the long term. These long-term effects could be investigated with the aid of longitudinal research, in which multiple measurements are made over time.

In this study, the influence of parking policy on shared mobility is explained on the basis of theories regarding nudging and behavior. However, this relationship can also be explained from other theoretical frameworks. Think in particular of theories regarding land-use in which the emphasis is not on behavior, but on the way in which space is used. The importance of this has already emerged in this study in the form of densification and how municipalities deal with scarcity of public space. By explaining the influence of parking policy on shared mobility on the basis of land-use theories, new insights can be gained into this relationship.

Finally, as mentioned with the limitations, the users of shared mobility were not included in the survey as respondents. The influence of parking policy on the behavior of users of shared mobility has been investigated on the basis of existing literature and interviews with policy makers and providers of shared mobility. However, to examine the effect of policies on user behavior, it would also be useful to examine this among users themselves. Similar research could be done in further research, but with a focus on users. A survey with users as respondents would be a suitable method for this. By questioning users, the relationship between parking policy and behavior can be better investigated.

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## Appendix A: Interview guide Municipalities

Bedanken voor deelname aan interview. Even voorstellen. Toestemming vragen voor opnemen. De data wordt alleen gebruikt voor mijn onderzoek.

### Deel 1: Deelmobiliteit in de stad

Vragen over deelmobiliteit in <stad>

- Wat zijn de grootste aanbieders van deelmobiliteit in <stad>?
- Welke vormen van vervoer? (auto/fiets/scooters?)
- Groeit het aanbod deelmobiliteit in de stad?

### Deel 2: Parkeerbeleid

Doel van het beleid

1. Wat is het doel van het parkeerbeleid van de gemeente? Waarom?
2. Wordt er met het parkeerbeleid geprobeerd het gedrag van inwoners te sturen? Zo ja, waarom?
3. Heeft het parkeerbeleid volgens jou effect op het autogebruik onder inwoners? Hoe zie je dit?
4. Heeft het parkeerbeleid volgens jou effect op het autobezit onder inwoners? Hoe zie je dit?
5. Is het een doel met het parkeerbeleid om het autogebruik en bezit te veranderen?

### Deel 3: Deelmobiliteit in parkeerbeleid

Onderscheid autodelen en fietsdelen

1. Wordt er in het parkeerbeleid een onderscheid gemaakt tussen autodelen en fietsdelen?
2. Is er apart beleid omtrent fietsdelen?
  - Waarin onderscheidt dit beleid zich van elkaar?
  - Waarom is dit beleid verschillend?

Onderscheid commerciële en private aanbieders

1. Wordt er in het parkeerbeleid een onderscheid gemaakt tussen commerciële en private aanbieders?
  - Hoe?
  - Waarom is er een onderscheid gemaakt?
2. Hoe is de verhouding commerciële en private (particulier) deelmobiliteit in de gemeente?
  - Welke invloed heeft dit op het parkeerbeleid

Beleidsregels in parkeerbeleid over deelmobiliteit

Correctie van parkeernorm

- Waarom is er voor een correctie op de parkeernorm gekozen?
- Hoe is dit besloten? Is hier onderzoek naar gedaan? Is er gekeken naar andere gemeenten?
- Waarom wordt de correctie bepaald aan de hand van een mobiliteitsplan?

Korting parkeervergunning

1. Wordt er door de gemeente een korting op de parkeerkosten aangeboden aan aanbieders van deelmobiliteit? Waarom?

#### **Deel 4: Relatie parkeerbeleid en deelmobiliteit**

1. Heeft de aanwezigheid van deelmobiliteit in de stad gezorgd voor een verandering in het parkeerbeleid? Waarom?
2. Andersom: Heeft het parkeerbeleid gezorgd voor meer deelmobiliteit in de stad? Waarom?
3. Wordt er eerst parkeerbeleid gemaakt, of is er eerst deelmobiliteit en wordt daarop parkeerbeleid omtrent deelmobiliteit gemaakt?
4. Hebben jullie als gemeente contact met aanbieders van deelmobiliteit over het parkeerbeleid?
5. Nemen jullie de wensen van aanbieders mee in het beleid?
6. En in hoeverre nemen jullie de gebruikers en inwoners mee in de totstandkoming en de uitvoering van het parkeerbeleid?
7. Zijn er verder volgens jou nog verbanden tussen deelmobiliteit en parkeerbeleid die we nog niet hebben besproken?

Bedanken voor het interview. Aanbieden om resultaten te delen wanneer het onderzoek afgerond is.

## Appendix B: Interview guide providers shared mobility

Bedanken voor deelname aan interview. Even voorstellen. Toestemming vragen voor opnemen. De data wordt alleen gebruikt voor mijn onderzoek.

### Deel 1: Deelmobiliteit

#### Aanbod

1. Welke vormen van deelmobiliteit bieden jullie aan? Hoeveel?
2. Bieden jullie dit door heel Nederland aan? In grote steden of ook in dorpen?
3. Sinds wanneer bieden jullie deelmobiliteit aan?
4. Hebben jullie nog, naast gewoon geld verdienen, nog een ander doel met het aanbieden van deelmobiliteit?
5. In hoeverre zien jullie doorgroeimogelijkheden voor het aanbieden van deelmobiliteit?
6. Welke? Wat zijn de voorwaarden?

#### Gebruik

1. Wordt er veel gebruik gemaakt van de deelvoertuigen? Staan voertuigen vaak ongebruikt?
2. Is er voldoende bekendheid onder de mensen?
3. Onder welke doelgroepen zit er groeipotentieel?

#### Gedrag

4. Over het algemeen kan je zeggen dat mensen wat slordiger omgaan met een auto die niet van hun is dan met een eigen auto. Hoe merken jullie dat ook onder jullie gebruikers?
  - Parkeergedrag?
  - Doen jullie hier iets aan?
5. Weet je wat het effect van jullie voertuigen op het autobezit van mensen is?

### Deel 2: Parkeerbeleid gemeenten

6. In hoeverre heeft het parkeerbeleid in een gemeente invloed op jullie keuze om wel of niet deelmobiliteit aan te bieden? En de hoeveelheid?
7. Kan het parkeerbeleid in een stad het aanbieden van deelmobiliteit voor jullie beperken? (dure parkeervergunningen of weinig parkeerplaatsen vanwege lage parkeernorm) Waarom beperkt dit jullie?
8. Kan het parkeerbeleid in een stad een stimulerende factor voor het aanbieden van deelmobiliteit zijn? Dus wanneer er bijvoorbeeld parkeerplaatsen worden gereserveerd voor deelauto's. Waarom stimuleert dit jullie?
9. Nemen gemeenten jullie wensen ook mee in het opstellen van parkeerbeleid?
10. Wanneer jullie voor het eerst de markt betreden in een nieuwe stad, gebeurt het dan vaak dat er nog geen beleid is op deelmobiliteit?
11. Wat vind je over het algemeen van de rol van gemeenten in het faciliteren en stimuleren van deelmobiliteit?
12. Is er een groot onderling verschil tussen de beleidsregels van gemeenten?
13. Zijn er steden waar voor jullie slechte beleidsregels gelden?

Bedanken voor het interview. Aanbieden om resultaten te delen wanneer het onderzoek afgerond is.

## Appendix C: Coding scheme

Code Group	Subcodes and details	Examples
Spatial context	Description of the spatial context and associated characteristics	<i>"In the center of Eindhoven you don't really have a lot of ground level parking. We don't have a historic downtown"</i> (Dijker, personal communication, 13-04-2021)
Densification	Limited space, allocating resources, pressure on public space, scarcity, densification issues	<i>"This urban densification is increasing in Nijmegen.. that is not possible with the current level of car ownership"</i> (Beumer, personal communication, 14-04-2021)
Shared economy	Car ownership, car use, sharing, access	<i>"What you now notice, for example, is that in cities people are ready to no longer own their own car"</i> (Herber, personal communication, 30-04-2021)
Policy goals	Objectives, ambitions, goals, facilitating, stimulating	<i>"What we now broadly say is that we actually stimulate all forms of shared car use"</i> (Ringnalda, personal communication, 15-04-2021)
Policy interventions	Parking standards, the spatial distribution of parking spots, parking time limits, parking costs, parking permits, taxes, employee parking, degree of enforcement	<i>"If you don't have regulation, you can't have guiding parking standards"</i> (Bulsink, personal communication, 31-05-2021)
Behavior	Influencing & steering, choices of transport mode, habitual behavior, car use	<i>"What we do is we manage the availability and price of parking spaces. And if that leads to people changing their behavior, then fine"</i> (De Bos, personal communication, 15-04-2021)
Shared mobility	Car sharing, bike sharing, scooter sharing, commercial, private, classic sharing, peer-to-peer, free-floating, station-based	<i>"We actually see that the station-based concept has achieved the most results in recent years, which I think is the goal of all providers, to get the private car off the street"</i> (Jorissen, personal communication, 29-04-2021)

