Preferences of potential residents for car-reduced neighbourhoods

Master thesis

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Arcadis:

Preface

I have always been fascinated by the interaction between mobility and the spatial environment. Mobility brings us where we want to go, but it also strongly affects the environment where we live, work, socialise and relax. Mobility opens a lot of opportunities, but it also causes damage. I choose this subject to contribute to the development of a built environment where mobility and liveability do not collide. A built environment which is enjoyed by the residents.

I am thankful for everyone who contributed to this thesis: my supervisors, experts whom I could interview, respondents of the survey and colleagues at Arcadis who made me feel welcome in their team.

Special thanks to my supervisors: To Yorick, who supported me during this project with critical feedback, and who was always open to questions. To Eric, who advised regarding the models, a part of this study which became larger and more complicated than I expected beforehand. To Kees, who advised regarding the general structure to keep the report easily readable. Lastly, to Bert, who, in his enthusiasm, reminded me of the relevance of this study.

After seven months of working on this thesis, it now comes to an end. I hope that this thesis inspires you, as a reader, to remain or simply start working on improving the liveability in your neighbourhood, in your city, in whatever role you are.

Gerben Andringa
Delft, September 2022

In this publication, I made use of data from the Netherlands Mobility Panel administered by KiM Netherlands Institute for Transport Policy Analysis.

Summary

Many cities in the Netherlands aim to reduce car-usage and ownership due to the negative side-effects of cars: the emission of air pollution and noise, reduced health of users and the large amount of space required for infrastructure. Next to the reduction in cars, cities have to build many houses due to the housing crisis. The construction of car-reduced neighbourhoods can contribute to both a reduction in car-usage and an increase in sustainable transport usage, and in the realisation of new housing in a liveable environment. These car-reduced neighbourhoods are characterised by:

1) Reduced accessibility for cars: they have limited access to streets and are parked at central locations instead of on the street.
2) Good accessibility by public transport and availability of shared vehicles.
3) Amenities in the neighbourhood, which allow travelling to them by bike or foot.
4) High quality of public space which stimulates activities, including much green.

This study investigates the importance of these characteristics, divided over eight attributes, to potential residents of car-reduced neighbourhoods. It uses a discrete choice experiment and analysis this using a mixed logit model to reveal the preferences regarding the characteristics.

This reveals that the car is important for potential residents, even though very car-minded persons were excluded from the survey. The walking time to parking is more important than access for cars to the street. Especially households with a car and(/or) young (<12 years) children attach much value to a short walking time. Preferences regarding the street differ per person, some prefer 5 km/h, others 30 km/h. Next to the car, public transport has much influence as well, but especially amongst young (<40 years) high-educated persons. Most persons, all but low/middle-educated persons above 40 years, prefer having a train, in combination with a bus and tram, over having only a bus and tram. Shared vehicles are much less important, although their presence is preferred. A short walking time to both public transport and shared vehicles is preferred, although it makes little difference whether this is 4 minutes or less.

Other included attributes were the availability of amenities in the neighbourhood, which stimulates the use of cycling and walking, green and amenities in public space. A broad range of amenities within 5 minutes walking is preferred. This includes a supermarket, primary school, (non) food shops and restaurants. Potential residents prefer neighbourhoods with a park over neighbourhoods with a lot of green, but without a park. Lastly, neighbourhoods which stimulate activities through the availability of playgrounds and outdoor sports facilities are preferred, especially by households with children.

This study also investigates the effect of different characteristics of the choice maker and the neighbourhood on the likelihood to relinquish a car. The availability of good public transport, preferably more than just a bus, and shared vehicles are key when someone wants to relinquish his car. Also, a short walking time to these, as well as having a broad range of amenities in the neighbourhood is valued. Nonetheless, the car still plays a small role. A low speed is preferred – when having access with 30 km/h, the likelihood to relinquish a car strongly decreases because the neighbourhood attracts those who want to keep their car due to the better car-accessibility. Regarding the walking time, short walking times are still preferred. Lastly, preferences regarding public space are similar to the experiment about the willingness to live in a neighbourhood. This is logical since these are less related to the car.

Lastly, this study applies the results to multiple real neighbourhoods. This revealed that especially well-accessible neighbourhoods such as IJburg are popular. Car-included neighbourhoods are in general slightly preferred over car-reduced neighbourhoods, but if cars remain having some access (low speed) and the neighbourhood is well accessible by public transport, car-reduced neighbourhoods can compete with car-included neighbourhoods.

Samenvatting

Veel steden in Nederland zijn van plan autogebruik en -bezit terug te dringen vanwege de negatieve gevolgen van de auto. Dit zijn de uitstoot van luchtvervuilende stoffen, afnemende gezondheid van gebruikers en het grote ruimtegebruik. Bovendien is er in steden enorme vraag naar woningen als gevolg van het woningtekort. De ontwikkeling van autoluwe woonwijken kan bijdragen in het verminderen van autogebruik en -bezit, en het realiseren van woningen in een leefbare omgeving. Deze wijken worden gekarakteriseerd door:

1) Beperkte toegang voor auto's: beperkte toegang tot straten en parkeren op afstand.
2) Goede bereikbaarheid met openbaar vervoer, en beschikbaarheid van deelvervoer.
3) Voorzieningen in de wijk zelf die lopend of fietsend te bereiken zijn.
4) Hoge kwaliteit van de openbare ruimte waar activiteiten worden gestimuleerd en veel groen aanwezig is.

Deze studie onderzoekt hoeveel waarde potentiële bewoners van autoluwe wijken hechten aan deze karakteristieken, verdeeld over acht attributen. Dit wordt gedaan door middel van een discreet keuze-experiment, wat geanalyseerd wordt via een mixed logit model.

Dit laat zien dat de auto erg belangrijk is voor potentiële bewoners, zelfs als de voorkeuren van sterk autogeoriënteerde personen niet meegenomen worden. De looptijd naar de parkeerplaats is echter belangrijker dan of auto's toegang hebben tot de straat. Een korte looptijd heeft de voorkeur, vooral voor personen met een auto en(/of) jonge kinderen. Wat betreft toegang tot de straat voor de auto wisselt het of personen een voorkeur hebben voor een snelheid van 5 of 30 km/h. naast de auto is ook openbaar vervoer belangrijk, voornamelijk onder jongere personen (<40). De meeste personen, alle behalve personen ouder dan 40 jaar en met een laag/middelbaar opleidingsniveau, hebben bij voorkeur een trein, tram en bus boven alleen een tram en bus. Deelvervoer is bij lange na niet zo belangrijk als openbaar vervoer, al is de aanwezigheid van deelvervoer gewenst. Naar zowel openbaar vervoer als deelvervoer is een korte looptijd gewenst, al maakt het nauwelijks verschil of dit 4 minuten of minder is.

Naast vervoersmiddelen zelf keek dit onderzoek ook naar andere attributen: de nabijheid van voorzieningen, waardoor lopen en fietsen wordt gestimuleerd, groen en voorzieningen in de openbare ruimte. Wat betreft voorzieningen hebben potentiële bewoners de voorkeur voor een groot aanbod: een supermarkt, basisschool, (non)foodwinkels en horeca. Wijken met een park hebben de voorkeur boven wijken met veel groen, maar geen park. Tot slot verdienen wijken die activiteiten stimuleren door speeltuinen en buiten sporten de voorkeur, voornamelijk in het geval van huishoudens met kinderen.

Dit onderzoek keek ook naar het effect van verschillende karakteristieken van de keuzemaker en autoluwe woonwijken op de waarschijnlijkheid dat die persoon zijn auto weg zou doen. De aanwezigheid van goed openbaar vervoer (meer dan alleen een bus) en deelvervoer is cruciaal wanneer iemand zijn auto weg doet. Een korte looptijd hiernaartoe, alsook een breed aanbod aan voorzieningen in de wijk is ook gewenst. Ook wanneer iemand zijn auto weg doet blijft de auto een rol spelen, al heeft nu een lage snelheid in de straat de voorkeur: als auto's toegang hebben met 30 km/h daalt de kans dat iemand zijn auto weg wil doen sterk, omdat juist mensen die de auto willen houden tot de wijk worden aangetrokken. Voorkeuren wat betreft de laatste twee attributen, groen en de kwaliteit van de openbare ruimte, zijn vergelijkbaar met de resultaten uit het experiment voor de voorkeur voor een wijk. Dat is geen verrassing, omdat deze attributen in mindere mate gerelateerd zijn aan de auto.

Tot slot zijn de resultaten toegepast op enkele bestaande en geplande wijken. Dit liet zien dat vooral goed bereikbare wijken zoals IJburg populair zijn. In het algemeen zijn wijken waar de auto toegang tot heeft geprefereerd boven autoluwe wijken. Toch kunnen autoluwe wijken concurreren met auto-inclusieve wijken, als de auto enige vorm van toegang houdt (met lage snelheid) en er goed OV (trein) is.

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1. Introduction

1.1 Context

Since the 1960s, car ownership rapidly increased in Europe, including the Netherlands (CBS, 2019a; Nordlund and Garvill, 2003). Nonetheless, awareness of the negative side effects of cars is growing. These side effects include emissions which are harmful to life and climate, noise and a decreased level of safety (Nieuwenhuijsen and Khreis, 2016; Selzer and Langendorf, 2019; Baehler and Rérat, 2020). Next to that, cars require a lot of space, to drive but also for parking near the origin and destination of a trip. However, most cars are parked for 23h of the day (Municipality of Amsterdam, 2020; Kirschner and Lanzendorf, 2019; KiM Netherlands Institute for Transport Policy Analysis (KiM), 2022b). Figure 1.1 reveals the space which is consumed by cars compared to other transport modes. KiM (2022b) states that around 50% of public space in the Netherlands is dedicated to cars. Space however is scarce. 1.1 million houses have to be built in the Netherlands by 2035, largely in urban regions (Ministry of the Interior and Kingdom Relations, 2020). Residents of these houses require additional amenities as well as a pleasant living environment (MRA Platform Smart Mobility, 2021). The Dutch national spatial vision, as well as many municipal spatial visions, steer towards a reduction in car-usage and presence. Sustainable transport modes, which are much more space efficient than the car, should be stimulated to reduce car-usage (Ministry of the Interior and Kingdom Relations, 2020).

Multiple municipalities are developing car-reduced neighbourhoods, because these allow using space for other purposes than the car, and contribute to an increase in usage of sustainable transport modes, and reduction in car usage and thereby also a reduction in the negative effects of cars (Selzer, 2021; Melia et al., 2012). These neighbourhoods are generally characterised by the following four characteristics (Melia et al., 2012; Selzer and Lanzendorf, 2022; Selzer, 2021; Niewenhuijsen, 2021; Crawford, 2002; Moreno et al., 2021; Nieuwenhuijsen and Khreis, 2016; Municipality of Amsterdam, 2017; Municipality of Utrecht, 2021; Municipality of Delft and marco.broekman, 2019; Rotterdam Makers District, 2019) :

1) Measures to reduce access for cars:
    a. Low parking rate to reduce space consumption by cars.
    b. Parking regulations make it more costly to park a car.
    c. Parking at central locations (garages) and not on the street to use space more efficiently.
2) Good alternative forms of transport, such as public transport of a high level and shared vehicles to stimulate the use of sustainable transport.
3) Amenities in the neighbourhood, to make them good accessible by foot or bike.
4) High quality of space, with a lot of green, to ensure a very liveable neighbourhood.

The literature overview (chapter 3) elaborates on these characteristics.

1.2 Knowledge gap and research objective

Even though car-reduced neighbourhoods are being developed, they must be able to attract residents because of several reasons. First, if they do not attract enough persons, houses might not be sold (when ignoring the current housing shortage), which makes them

Figure 1.1, space consumption per transport mode (Municipality of Utrecht, 2021b)

economically unfeasible and thereby makes project developers unwilling to car-reduced neighbourhoods. Second, if car-reduced neighbourhoods are unable to attract residents, they cannot contribute to a shift towards sustainable mobility. For this second reason, it is not only important to attract residents in general, but especially residents who own a car, as those might reduce car-usage and even relinquish their car. Lastly, because of the housing crisis, many houses are required. If car-reduced neighbourhoods are not able to attract residents, other car-included neighbourhoods would be required, and these require more space due to the car, at the cost of other functions such as green.

To be able to attract residents, it is important to know the preferences of potential residents to be able to create neighbourhoods they like. This information is valuable for both municipalities (Municipality of Amsterdam, 2020; Municipality of Rotterdam, 2020; Municipality of Haarlem, 2021) and project developers (Selzer, 2021; Melia et al., 2012). The concept of car-reduced neighbourhoods is not completely new, thus experiences from existing car-reduced neighbourhoods can be used in the development of new ones. However, existing car-reduced neighbourhoods are generally relatively small, whereas planned car-reduced neighbourhoods such as the Merwedekanaalzone will house about 12,000 persons. In contrast, Baehler and Rérat (2020) studied the lifestyle and preferences of residents of nine car-reduced neighbourhoods, but these featured only between 20 and 426 dwellings. This is valuable knowledge, but it is based on people who already moved to a car-reduced neighbourhood. Their preferences might differ from persons who live in a car-included neighbourhood yet and behave according to most residents of those neighbourhoods.

Some other researchers studied the preferences of potential residents of car-reduced neighbourhoods (Gundlach et al., 2018; De Nies, 2020). However, these do hardly account for socio-demographic differences amongst persons, whereas differences exist and are likely to influence preferences (Van Wee, 2009; Van Acker et al., 2010). Both Gundlach et al. (2018) and de Nies (2020) recommend further research with a different sample. Selzer (2021) advises further research in different geographical contexts (than residents of car-reduced neighbourhoods) and with different social groups, because on one hand preferences and attitudes regarding car-reduced neighbourhoods will differ, but on the other hand, the car has become normal, which makes that also non-car-owners include the car in their residential location choice.

Knowledge regarding preferences of potential residents is not only relevant to be able to attract them. it also helps municipalities to make decisions in the conflict for space (Municipality of Delft, 2021). Next to this, it helps municipalities as well as companies to decide upon the transport system of a neighbourhood. Originally, the transport system of a neighbourhood was designed after the neighbourhood itself. Nowadays, municipalities aim to design these simultaneously. This makes it easier to include measures to change travel behaviour (MRA platform Smart Mobility, 2021; Municipality of Zwolle, 2021).

This study aims to give more insight into the preferences of potential residents of car-reduced neighbourhoods. This is valuable knowledge to municipalities (Municipality of Amsterdam, 2020; Municipality of Rotterdam, 2020; Municipality of Haarlem, 2021; Municipality of Delft, 2021). Next, this study aims to give more insight into how characteristics of both the neighbourhood and potential residents influence car-ownership, as this gives further insight into how car-reduced neighbourhoods could reduce car-ownership, even though effects are expected to be small (Melia et al., 2012).

1.3 Research questions

To fulfil the aim of this study, the following main and sub-questions have been formulated:

To what extent is the willingness to live in a car-reduced neighbourhood influenced by the availability of alternative transport modes, the accessibility of amenities and liveability?

To answer this main question, five sub-questions are being used. The combination of questions 1-4 reveals the importance of different aspects of a neighbourhood, while the last question estimates the effect of a possible car-reduction.

1-4 To what extent is the willingness to live in a car-reduced neighbourhood influenced by:

1. *access for cars to the neighbourhood?*
2. *the availability and proximity of public transport and shared vehicles?*
3. *the number of amenities within a short distance?*
4. *the design of public space?*

5 To what extent would the availability of sustainable transport modes, improvements in the proximity of amenities and liveability affect car-ownership, and thereby the required amount of parking spots?

1.4 Scope

This study aims to capture the effect of a relatively broad range of characteristics, related to the willingness of people to move to car-reduced areas. However, scoping is still needed to prevent this research from becoming very broad and superficial.

This study focuses on new residential neighbourhoods in an urban environment because these can be developed according to the preferences of potential residents. When redeveloping am existing neighbourhood, one has most likely to account for residents who support and who do not support the redevelopment of the neighbourhood, which is likely to result in different preferences. This does not imply that the results of this study cannot be used in redeveloping an existing neighbourhood, but one should be cautious when doing this.

The supply of amenities is not included, nor is the delivery of packages et cetera to residents. Access for emergency and municipal services is neither included, as it is assumed that these remain to have access to streets in the neighbourhood. Access for disabled persons to the neighbourhood is also excluded from this study, as it would be too detailed. This will be mentioned in the questionnaire, to reduce the probability that responses are being influenced by assumptions made by respondents.

The economic side of car-reduced neighbourhoods has been left out. They can have economic benefits because space which is now required for cars could be used for other purposes. Next to this, the health of residents might improve due to the absence of cars, resulting in fewer costs for health. However, it is questionable whether potential residents think about these economic effects, but it is unlikely that they would do this at the level of detail of a government. Next to that, it would make this study too large.

This study is subjected to residential self-selection, which Mokhtarian and Cao (2008) describe as "the tendency of people to choose locations based on their travel abilities, needs and preferences". This study analyses the importance of several characteristics of car-reduced neighbourhoods to potential residents, which is done with a focus to transport. However, even though transport is an important factor in the location choice (Kroesen, 2019), other factors might play a role as well (van Wee, 2009). The focus of this study is primarily on transport-related motivations, but due to the residential self-selection, these might be overestimated.

It is important to note that this study is based on the preferences of people of today. Society changes, and so do preferences. Spatial developments are usually for long periods: multiple decades or even a century. Much might change during this period, thus developments of today should not be constructed such that they cannot be changed later on.

1.5 Structure

This report starts with the methodology (chapter 2). This is followed by an overview of scientific literature regarding car-reduced neighbourhoods and what residents think of them. Chapter 4 gives a brief overview of the results of interviews with multiple experts, which were used as input in the creation of the choice experiment. Next, chapter 5 describes the construction of the survey, including the choice experiment, and how the survey is distributed. Chapter 6 elaborates on the results of the survey and the analysis. First, descriptive statistics are given, which show that all socio-demographic groups are represented, although differently distributed than in the population. Next, multiple multinomial logit models are estimated to define which parameters should be estimated in the final mixed logit model, which also includes an opt-out. The estimated parameters of this mixed logit model are also explained. Lastly, chapter 6 studies the relation between the likelihood of relinquishing the car and multiple characteristics of a neighbourhood or person. The next chapter, 7, applies the results of chapter 6, and compares multiple existing and planned neighbourhoods, using the estimated betas. This reveals which neighbourhoods are more and less popular. Lastly, chapter 8 gives the conclusion and discussion.

2. Methodology

This study aims to give more insight into the preferences of potential residents of car-reduced neighbourhoods, to attract car-reduced neighbourhoods which attract many residents and can reduce car-usage and car-ownership. As a result of this, attractive and liveable neighbourhoods which stimulate sustainable transport can be created. A discrete choice experiment is used to give these insights. Figure 2.1 gives the conceptual model behind this study. Two models are used to analyse the discrete choice experiment. These models (dark blue and cyan column) reveal the importance of different attribute levels when one chooses whether to relocate to a car-reduced neighbourhood, and to what type of car-reduced neighbourhood. This reveals how a car-reduced neighbourhood should look like (light blue). The conceptual model also reveals the effects of car-reduced neighbourhoods, which reveals their value compared to ordinary car-included neighbourhoods. This is strongly related to the topic of this study, but this study itself does not analyse nor estimate the effects of the optimal car-reduced neighbourhoods. This green block is based on frameworks from Melia (2014) and Nieuwenhuijsen and Khreis (2016). The next sections elaborate on the different parts of the conceptual model.

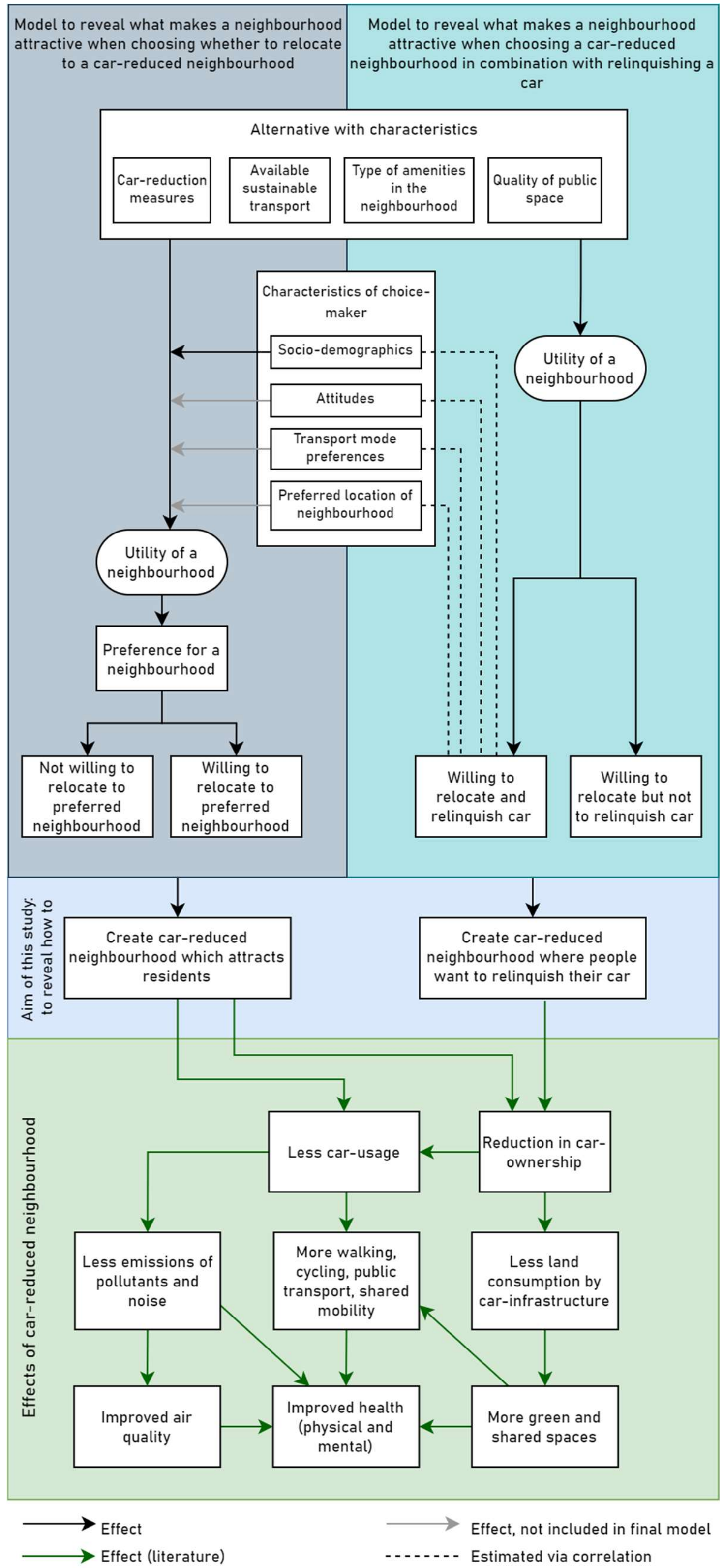


Figure 2.1, conceptual model

2.1 Why a discrete choice experiment?

To reveal to what extent different aspects influence the willingness to reside in a neighbourhood, it is important to know their importance to potential residents. Multiple methods are possible to do this. Like experts, persons could be interviewed (individually or via focus groups), which could give much insight into different topics. However, many interviews would be needed to be able to cover the preferences of different types of persons (for example, differences in age, education level, income, household composition etc.). Another disadvantage is that it would give limited insight into the importance of attributes in relation to others. This is also the case when using statements in a (digital) survey. If respondents are asked whether they find a certain element important, the risk exists that they find all elements important, and thus no trade-off is revealed. For example, Baehler and Rérat (2020) investigated which characteristics are important for residents of car-free neighbourhoods. However, the answers to the statements show that respondents found almost everything important, although some characteristics received more support than others.

A method which can give much insight in the importance of attributes is a discrete choice experiment (Molin et al., 1996). In such an experiment, multiple choice-sets are presented to respondents, who have to state their preference in every choice-set. This study uses a discrete choice experiment in which the alternatives in a choice-set are formed by neighbourhoods. Characteristics of these neighbourhoods are described via multiple attributes. The attributes are the same for each alternative, but the attribute levels differ. Under the assumption that respondents strive for utility maximisation, the importance of individual attribute levels can be estimated (McFadden, 1986; Molin et al., 1996). This can be analysed using a logit model.

Multiple logit models exist, such as the traditional multinomial logit (MNL)-model and the mixed logit (ML)-model. These can give much insight into the importance of attributes, but, logically, only of those which are included in the model. In reality, many other factors play a role in the residential location choice (Van Wee et al., 2009). Nonetheless, an ML-model is able to reveal unobserved heterogeneity, although it cannot reveal the causes of that heterogeneity. This is easier to cover in an interview, which allows one to ask in-depth questions to clarify why respondents give a certain answer. An advantage of a discrete choice experiment over interviews is that it is able to handle many responses, which can be collected relatively easy as one questionnaire can be sent to all (potential) respondents. Because a discrete choice experiment is more suitable to give good insight into the importance of attributes and can handle many responses, this method is chosen.

2.2 Selection of attributes

To describe the neighbourhoods in the discrete choice experiment, attributes are used. These attributes, as well as their levels, are based on literature and interviews.

2.2.1 Literature study

Many authors described different aspects of car-reduced neighbourhoods, among others why these neighbourhoods should be realised, what they should look like and how residents of existing car-reduced neighbourhoods live. Other authors focus on individual aspects which are related to car-reduced neighbourhoods, such as parking management or amenities. This gives insight into what car-reduced neighbourhoods look like, but also on the effectiveness of different measures which are intended to reduce car-usage. Not only scientific literature is used, but also plans from (Dutch) municipalities, because this gives more concrete applications, next to those given by scientific literature.

2.2.2 Interviews

Even though car-reduced areas aim to reduce car-usage, they also aim to create a liveable neighbourhood which residents enjoy; neighbourhoods are more than mobility only. However, what people value about public space is very subjective. Interviews with experts are used to find out more about general preferences, and measures to design public space such that it creates a liveable environment, valued by many residents. Experts with different backgrounds are interviewed to discuss different aspects of car-reduced neighbourhoods from different perspectives. Next to that, this allows to broaden the perspective of the author. Experts include (appendix A gives a list of all interviewed experts):

- Sustainable mobility experts from Arcadis and Over Morgen
- Urban planners from Arcadis
- Professors from the department of Urbanism from the faculty of Architecture of Delft University of Technology
- Employees of several municipalities

The results of these interviews are used in the choice sets, which form the core of the discrete choice experiment. This applies primarily to attributes related to the design of public space, because these are most subjective.

2.3 Data collection

2.3.1 Survey construction

To be able to estimate the importance of attributes of a neighbourhood, choice data is required. This is collected using choice-sets, in which respondents have to state their preference for a neighbourhood. Choice sets are created using an orthogonal design. An efficient design might result in more reliable parameter estimates (Rose and Bliemer, 2009), but it requires priors and software such as Ngene to create the choice sets (Molin, 2021; Kim et al., 2017). Originally, a latent class model was to be used in this study[1]. The manual of Ngene (ChoiceMetrics, 2018) does not provide information about creating an efficient design for a latent class model. Next to that, if priors would be needed, they might be required for all individual classes, although classes are unknown beforehand, and thus, no priors can be estimated. Therefore, the usage of an orthogonal design is favoured in this study. Nonetheless, this design is created using Ngene.

Eight attributes were chosen to describe the characteristics of a neighbourhood, each having 3 levels. Because of this, 27 choice-sets are required. presenting this many choice-tasks to every respondent would require too much effort. Therefore, these are divided into three blocks, of which each contains nine choice-tasks. This is a common number of choice-tasks and should be doable (Bahrampour et al., 2020; Molin, 2021).

Next to choice data, also other types of data are required to be able to further analyse the choices. For example, to reveal differences between different types of households, socio-demographic data is required. Besides choice-data, the following types of data are collected:

- Socio-demographic data
- Attitudes via multiple statements
- Transport behaviour and preferences

Both the choices and other data are gathered via a questionnaire constructed in Qualtrics under a license of Delft University of Technology. Attributes of the alternatives (neighbourhoods) are determined based on literature, existing and planned car-reduced neighbourhoods and interviews with several experts.

2.3.2 Survey distribution

This study focusses on people who might want to live in car-reduced neighbourhoods in urban areas. Therefore, respondents who currently live in urban areas are most likely to be willing to relocate to such areas, because they already live in a city. Because of this, residents of cities were approached via flyers[2]. The cities Rotterdam, Delft and Amersfoort were selected for this. These cities differ in size and function. Rotterdam and Delft are both situated in the southern side of the Randstad. Rotterdam is a large city, providing both residential, industrial and office areas. Delft is a smaller city, but still with over 100.000 inhabitants, oriented towards Rotterdam and The Hague. Amersfoort is well connected with the Randstad, but as it lays on the edge of the Randstad, it is also connected to a more rural part of the Netherlands.

It is likely that preferences for car-reduced neighbourhoods differ amongst different groups of inhabitants of these cities. Therefore, flyers should not be distributed in random neighbourhoods. This could cause that some socio-demographic groups are not included in the sample. Neighbourhoods were therefore selected beforehand, based on data from the cities themselves and the CBS. K-means clustering (see Likas et al., 2003) has been used to create clusters of neighbourhoods with similar characteristics for every city. For every cluster, one or more neighbourhoods (depending on the size of the cluster) are chosen for the distribution, which are the

[1] The usage of a latent class model appeared not to be possible, as multiple models via different programs resulted in parameter estimates which were much larger than usually.

[2] Originally, the survey was to be distributed via municipalities. This appeared not to be possible, amongst others due to the General Data Protection Regulation of the EU.

neighbourhoods which give the best representation of their cluster. Clusters are based on average age, average household size, average standardised household income and the average number of cars per household. Note that accessibility of these neighbourhoods is not used as a characteristic, although this influences preferences, especially in the case of people with a preference for public transport over the car (Van Wee et al., 2002). For example, people who live in a neighbourhood which is well accessible by public transport might have a more positive attitude towards public transport. Also note that averages might not give the best representation of a neighbourhood, since it does not say anything about the distribution.

Neighbourhoods where the questionnaire should be distributed are based on the distance from their coordinates to those of the cluster to which they belong. The neighbourhood with the smallest distance has the best fit for that cluster, which makes it the most representative neighbourhood. Some clusters contain many neighbourhoods. In this case, multiple neighbourhoods are chosen. These are also chosen based on their representativeness for the cluster as a whole, but they are not necessarily the most representative neighbourhoods. This is because this might result in adjacent neighbourhoods, whereas the cluster features neighbourhoods distributed over the entire city. For example, a cluster in Rotterdam might feature neighbourhoods in the northern and southern part of the city. Only including neighbourhoods from the south might bias the result because preferences of people in the northern part (which is for example closer to the central station) might differ from those of inhabitants of the southern part.

2.3.3 Target group

Not all respondents were likely to reside in a car-reduced area. Some will not be willing at all to live at a location where the car cannot be parked very close to their residence. These were excluded using filter questions, as they would bias the result: they would give preferences for neighbourhoods where they are not willing to live. Section 0 elaborates further on this selection.

2.4 Model estimation

It is assumed that people strive for utility maximisation (McFadden, 1986), and thereby choose the neighbourhood with the largest utility. The utility U_i of neighbourhood (alternative) i can be described as:

$$U_i = V_i + \epsilon_i \ (1)$$

with V_i being the systematic part and ϵ_i as the random part, to reflect unobserved factors (Molin and Maat, 2015; Chorus, 2020a). The utility is influenced by the attributes of a neighbourhood, and the weight given to them according to the tastes of the choice-maker (See figure2.1. The systematic part of alternative i is the sum of individual attributes levels of that alternative, x_{ik}, multiplied with their weight β_k:

$$V_i = \sum_{k=1}^{K} \beta_k * x_{ik} \ (2)$$

Attributes are characteristics of a neighbourhood, such as the possibility to enter the neighbourhood by car.

If the random part is assumed to be independently and identically distributed (IID) Extreme value type 1, this results in the multinomial logit (MNL) model. The probability P of respondent n choosing neighbourhood i out of set J, with β as vector with taste coefficients, is according to the MNL-model (Hess et al., 2011):

$$L_n(i \mid \beta) = \frac{e^{\beta' x_{ni}}}{\sum_{j=1}^{J} e^{\beta' x_{nj}}} = \frac{e^{V_{ni}}}{\sum_{j=1}^{J} e^{V_{nj}}} \ (3)$$

An MNL-model only including the attributes does not allow to estimate differences amongst persons. This can be done in multiple ways: An option is using interactions between attributes and socio-demographics (Guo et al., 2020), which can be done in an ordinary MNL-model but also in an ML-model. Another option is using an ML-model with random parameters (Greene and Hensher, 2007). The latter would give insight into to what heterogeneity exists for the individual attributes, but it would not explain what causes this heterogeneity, and thus, it cannot be applied in spatial developments. Interactions on the other hand allow to be applied in practice. For example, an interaction between access for cars to the neighbourhood and households with/without children allows to reveal whether preferences of households with children regarding car access differ from those without children. This knowledge can be used when developing a new neighbourhood. However, heterogeneity can only be shown for those interactions which are included in the model. Next to that, heterogeneity might still exist within the groups as created by the interactions. For example, in the previous example of car access and having children, heterogeneity might exist amongst households with (or without) children. This heterogeneity is not revealed, except more interactions are added, which results in a more complicated model.

To discover which interactions should be included, multiple MNL-models were estimated, each with interactions with a different group of characteristics (socio-demographics, attitudes, transport mode preferences and preferred location of the neighbourhood in which the respondent wants to live). The dataset for these models contains the stated preferences of respondents for neighbourhoods, regardless of whether they were willing to live in their preferred neighbourhood or not. For each of these models, multiple iterations are used to improve the model. In every iteration, the least significant interaction is removed. This does not mean that this interaction has no effect at all, but considering the dataset, it is not significantly different from zero. Only interactions which are not significant for both attribute levels are removed. If the interaction is significant for one level, but insignificant for the other, the interaction is kept in the model. Beta's for the attributes themselves always remain in the model, even if the parameter estimate for both levels is insignificant. Removing the attribute would seem like the attribute has no effect at all, whereas the estimated effect is not significantly different from zero (Amrheim et al., 2019).

Out of the models with interactions, the model with the largest explanatory power is selected. This was the model with interactions with socio-demographics (see appendix F). Next, a ML-model is estimated, with the same interactions as the selected MNL-model. Next to the betas for the attributes and interactions, this model contains a random parameter C which has a mean and standard deviation. The mean of this constant reveals a basic preference for the willingness to relocate to a car-reduced neighbourhood in contrast to not relocating. The standard deviation allows to reveal unobserved heterogeneity amongst respondents, even though this cannot be explained (Train, 2002). Another benefit of the error component is that it relaxes the IIA (independence of irrelevant alternatives) property of the MNL (Christiadi and Cushing, 2007; Fiebig et al., 2010). To distinguish between persons who want to live in their preferred neighbourhood, and those who are not, data and the model should account for this. If someone was willing to live in his preferred neighbourhood, this was regarded as a preference for that neighbourhood (either alternative 1 or 2). If someone was not willing to live in his preferred neighbourhood, this was regarded as an opt-out (alternative 3). As a result of this, only those preferences of people who really want to live in a neighbourhood remain. These preferences are stronger than when including also those preferences of people who do not want to live in their preferred neighbourhood. This extra 'alternative', the opt-out, was not present in the dataset which was used for the MNL models and is the only difference between the datasets. The resulting systematic utility functions are given below (based on Veldwijk et al., 2014) These do not mention the exact attributes yet, since they are determined in section 5.1.

$$V_{alt1} = C + \sum_{k=1}^{K} \beta_k * x_{alt1,k} \quad (4)$$

$$V_{alt2} = C + \sum_{k=1}^{K} \beta_k * x_{alt2,k} \quad (5)$$

$$V_{alt3=opt-out} = 0 \quad (6)$$

Multiple draws are required to estimate the parameters, due to the random parameter (Revelt and Train, 1998; Hensher and Green, 2003; Chorus, 2020b). Halton draws are suitable for this, as these are more efficient than random draws (Train, 2000). The model was ran over a range of increasing number of Halton draws (10, 20, 50, 100, 200, 500, 1000, 2000, and if necessary more) to test when the mean and standard deviation of the constant, as well as the log-likelihood, turned stable (Hensher and Greene, 2003; Chorus, 2020b).

The interactions in the final model allow to reveal differences between persons. These will be made visible by creating multiple personas who represent a group of respondents. This makes differences between persons more tangible, than a list of the basic betas, and the interactions which both only apply to certain respondents.

2.5 Reduction in car-ownership

Multiple methods are used to estimate the effect of different groups of characteristics on car-ownership. These groups of characteristics are the attributes of the neighbourhood, socio-demographics, attitudes and the preferred location of the neighbourhood. The effect of attributes of the neighbourhood is estimated with a similar method as the influence of attributes on the willingness to live in a neighbourhood, as described in the previous section. Again, a ML-model is used, with a constant with a random part. This model allows to estimate the probability that someone is likely to relinquish his car. The general systematic utility functions are the same as formulas 4-6. If someone is not likely to relinquish his car, or neither likely/unlikely, this is regarded as an opt-out. If someone is likely to relinquish his car, the preferred choice set forms the chosen alternative. In contrast to the willingness to live, no interactions are included since these resulted in an unreliable model, which can be explained by the low number of respondents being likely to relinquish their car in one or more choice sets.

The effect of the other characteristics is estimated by calculating the bivariate correlation between the likelihood to relinquish the car (whether someone is likely or not) and a group of characteristics. These correlations were estimated using SPSS. The Spearman's rank correlation coefficient has been used since this is suitable for ordinal data (Hauke and Kossowski, 2011).

2.6 Application

The analysis as described in sections 2.3 and 2.4 reveals the importance of multiple attributes on the willingness to live in a neighbourhood with certain characteristics, or the likelihood to relinquish a car when moving to that neighbourhood. However, these neighbourhoods are still conceptual. To make the results more tangible, they are applied using existing/planned neighbourhoods to reveal which are more or less popular. Ten neighbourhoods, both car-reduced and car-included, were selected and are compared with each other. Their characteristics regarding the attributes including in this study were expressed in the attribute levels. It should, however, be noted that this study uses few levels per attribute. For example, this study uses only three combinations of amenities within 5 minutes walking (1): Supermarket and primary school; 2): 1)+(non) food shops; 3): 2)+restaurants). In reality, many more combinations exists, or a neighbourhood has even less amenities than level 1. Therefore, the attribute level which best describes the type of amenities in a neighbourhood is chosen.

To define which neighbourhoods are more or less attractive, the probability is estimated that someone prefers that neighbourhood. This is done for multiple personas, to account for socio-demographic differences. Formula 3 gave the standard logit formula to estimate the probability that an individual n prefers alternative i. This formula does not account for random parameters, which are used in a mixed logit (even though the model in this study only uses a single random constant). To estimate the choice probability, formula 7 can be used (Train, 2002).

$$P_{n,i} = \int L_{n,i}(\beta) f(\beta|\theta) d\beta \quad (7)$$

With:

$$L_n(i \mid \beta) = \frac{e^{\beta' x_{n,i}}}{\sum_{j=1}^{J} e^{\beta' x_{n,j}}} \quad (8)$$

Formula 7 is not in closed-form. Therefore simulation over a number of draws (R) is required. β^r is the r[th] β drawn from $f(\beta|\theta)$ (Train, 2002).

$$\check{P}_{n,i} = \frac{1}{R} \sum_{r=1}^{R} L_{n,i}(\beta^r) \quad (9)$$

The number of draws is increased until the estimated choice-probabilities for neighbourhoods stabilises. This reveals which real neighbourhoods are more, and which are less attractive. It also allows to see whether car-reduced neighbourhoods are more attractive to potential residents of car-reduced neighbourhoods, than car-included neighbourhoods. Next to the popularity, it also reveals how neighbourhoods could be improved to make them more popular. This knowledge can be used in the development of new neighbourhoods, and improvement of existing neighbourhoods.

3. Literature overview

Growing awareness exists that cities have to change. They should become more liveable and sustainable, to improve health and to be able to reduce the effects of and react to climate change (Nieuwenhuijsen, 2016; Nieuwenhuijsen and Khreis, 2016; Moreno, 2021; Marcheschi et al., 2022). Reducing cars in cities strongly contributes to these goals. Cars emit CO_2 and multiple other greenhouse gases, as well as other air pollutants such as particulate matter. These emissions negatively affect both health and the environment, and part of them increase climate change (HEI, 2010; Rau, 2018; Nieuwenhuisen, 2016). Next to this, cars are responsible for noise and injuries (Nieuwenhuijsen and Khreis, 2016; Rau, 2018; Selzer and Lanzendorf, 2019; Gössling, 2020). Besides affecting health by emissions and noise, using the car as transport mode reduces health, especially compared to active modes (Nieuwenhuijsen and Khreis, 2016; de Nazelle et al., 2011). Lastly, cars require much infrastructure, which consumes a lot of space: up to 50% of public space in the Netherlands is dedicated to cars (Nieuwenhuijsen, 2021; Gössling, 2020; KiM, 2022b), while most cars are parked for 23h of the day (Municipality of Amsterdam, 2020; Kirschner and Lanzendorf, 2019; KiM, 2022b). Space occupied by cars cannot be used for health and liveability-improving functions such as green (Nieuwenhuijsen and Khreis, 2019; Moreno et al., 2021).

A concept which contributes to the reduction of cars, and improvements in liveability and health are car-reduced, or in a more extreme form car-free, neighbourhoods or even cities (Crawford, 2002; Melia, 2014; Nieuwenhuisen and Khreis, 2016; Selzer and Lanzendorf, 2019; Moreno et al., 2021; Marcheschi et al., 2022). The concept of car-reduced neighbourhoods is not new (Selzer and Lanzendorf, 2022; Wang et al., 2021). Already in 2000, Crawford argued why making cities car-free was a necessity to keep them liveable (Crawford, 2002). These neighbourhoods are characterised by:

1) Limited access for cars and limited provided parking, which is eventually separated from the residence (Melia et al., 2012; Selzer and Lanzendorf, 2022).
2) Stimulated use of sustainable mobility (other than the car): public transport, shared mobility, cycling and walking by providing easy access to them (Selzer, 2021; Niewenhuijsen, 2021).
3) Stimulated use of active modes by providing multiple amenities within the neighbourhood itself (Crawford, 2002; Moreno et al., 2021).
4) High quality of public space with much green and which stimulates interaction amongst people, as the low number of cars allows to use public space differently (Nieuwenhuijsen and Khreis, 2016; Nieuwenhuijsen, 2021; Moreno et al., 2021).

The following sections elaborate on these four characteristics. This is done based on scientific literature regarding the measures themselves, as well as their acceptance by (potential) residents. Also, data retrieved from (plans for) existing car-reduced neighbourhoods has been used.

3.1 Reduced access for cars

Reducing access for cars has two components. The first component is the access for cars to streets: are cars allowed on some or all streets, and with what speed? The second component is parking, as this can also be used to reduce the number of cars.

3.1.1 Strategies to reduce access

Multiple strategies exist to reduce access for cars to a neighbourhood. These range from reducing through traffic to completely car-free neighbourhoods. In case of limiting through traffic, residents remain having access to the neighbourhood, but traffic which does not have to be in the neighbourhood is directed around it (Municipality of Rotterdam, 2020) and some streets have blockades by among others poles, to prevent through traffic (Nieuwenhuijsen, 2021). Car-free neighbourhoods are neighbourhoods where cars are physically excluded from the neighbourhood, even though parking might be available at the edge of these neighbourhoods. Note that other authors might use a different definition for car-free. The definition of a car-reduced neighbourhood is broader than for a car-free neighbourhood. A car-reduced neighbourhood, as defined in this study, is a neighbourhood which aims to reduce car-use and car-ownership of its residents (similar to Selzer and Lanzendorf, 2022). Thus, a car-free neighbourhood is a car-reduced neighbourhood, but a car-reduced neighbourhood is not necessarily car-free.

Melia et al. (2012) recognize three types of car-reduced neighbourhoods (although called car-fee).

1) Limited access model: cars do not have access, although parking is sometimes allowed at the edge of the neighbourhood.
2) Vauban model, from the neighbourhood Vauban in Freiburg (Germany), where cars have access via the main street, but are not allowed to park in the area, except for loading/unloading.
3) Pedestrianised centres, which are the common pedestrian zones in city centres where no cars are allowed. However, this limitation is of commercial nature, and not because of liveability, which is acknowledged by Melia et al. (2012).

Plans of several car-reduced neighbourhoods reveal the following categories:

1) Car-free neighbourhoods with parking at central locations at the edge of the neighbourhood, similar to the 'limited access model' of Melia et al. (2012). Examples are the Merwedekanaalzone and GWL-terrain (resp. Municipality of Utrecht et al., 2021; GWL-terrein, n.d.).
2) Car-reduced neighbourhoods with parking at central locations at the edge of the neighbourhood, but access for cars with low speeds to the neighbourhood to drop/pick up goods. The neighbourhood is designed as shared space, thus cars, pedestrians and cyclists share the same street. Schieoevers-North is an example of this (Municipality of Delft and BURA urbanism, 2021).
3) Car-reduced neighbourhoods with parking at central locations in the neighbourhood. Cars have access to several main streets only. An example is Merwe-Vierhavens in Rotterdam (Rotterdam Makers District, 2019).
4) Car-reduced neighbourhoods where cars have (almost) full access, but can only be parked at several central locations. An example is the Sluisbuurt in Amsterdam (Municipality of Amsterdam, 2017).

3.1.2 Strategies to reduce parking

A common measure to reduce space-consumption by cars is by reducing the parking norm: the number of parking spots which should be provided per house (Kirschner and Lanzendorf, 2019; Lower and Szumilas, 2021, Christiansen et al., 2017a; Selzer and Lanzendorf, 2019). For car-reduced neighbourhoods, parking norms of 0.5 (Melia et al., 2012) and 0.65 (Selzer and Lanzendorf, 2019) were found. However, the Sluisbuurt in Amsterdam, which is still being developed, has a parking norm of 0.5, which should be reduced to 0.3 (Municipality of Amsterdam, 2017). This norm also applies to the Merwedekanaalzone in Utrecht (Municipality of Utrecht et al., 2021). A lower parking norm can lead to more competition for those parking spots. Multiple neighbourhoods provide a system where residents can rent parking spots (Melia et al., 2012; Christiansen et al., 2017b) or can buy a parking permit (Kirschner and Lanzendorf, 2019). These costs reduce the likelihood of car-ownership (Melia et al., 2012) and the willingness of car-owners to move to a car-reduced neighbourhood (de Nies, 2020). However, if someone has a reserved parking spot, the likelihood of using the car increases by a factor of three (Christiansen et al., 2017b). Although these reservation/permit systems intend to ensure the availability of parking spots for residents, a struggle arises regarding equity as a first come first serve system can be seen as unequal (Selzer and Lanzendorf, 2019). Another option is providing a permit at a cost to all residents who want to have a permit, without taking the number of parking spots into account. As a result of this, the number of permits might be larger than the number of parking spots (Kirschner and Lanzendorf, 2019).

Another strategy to reduce cars in the neighbourhood is separating residence and parking. (Kirschner and Lanzendorf, 2019;

Christiansen et al., 2017a; Selzer and Lanzendorf, 2019). This is one of the most effective measures to reduce car-usage according to Christiansen et al. (2017a). Christiansen et al. (2017b) showed that residents who had to walk more than 50m to their car made much more use of other-than-car modes, even though the number of trips, regardless of the mode, did not change. Car-usage as driver dropped by 5% for commuting, 24% for shopping and 13% for leisure, whereas active modes increased by 21% for shopping and 10% for leisure. However, Melia et al. (2012) state that the effect on car-usage in neighbourhoods with reduced parking might be larger than in neighbourhoods which do not allow the car because car-owners might not move to such car-free neighbourhoods. De Nies (2020) agrees with this and reveals that each additional minute walking to the car reduces the likelihood of a car-owner moving to a car-reduced neighbourhood by 13.5%. Christiansen et al. (2017a) found that not having an own dedicated parking spot has a much larger effect on the reduction in car-usage than the walking distance to the parking spot. Regarding two existing car-reduced neighbourhoods, Selzer (2021) reveals that they have a questionable effect on the reduction of car-ownership. Whereas three households got rid of the (second) car, because of other transport options, three other households bought a car, among others because of getting children.

Parking management goes further than reducing the number of parking spots and detaching residence and parking locations. It is not only applicable to residential areas, but also to destinations, such as offices. The availability of parking at the destination has a slightly larger effect on the reduction of car-usage (Christiansen et al., 2017a).

3.1.3 Viewpoint potential residents

The previous section described car-reduction measures from a top-down perspectives. This does not necessarily result in a neighbourhoods where persons want to live. To reduce car-usage and -ownership successfully, the perspective from (potential) residents is crucial. If residents do not accept or understand measures to reduce car-usage, these measures might not work out well. For example. in K6, a car-reduced neighbourhood in Darmstadt, Germany, residents parked their cars illegally in the neighbourhood because they did not understand the parking policy of the neighbourhood (to park cars at central locations at the border of the neighbourhood). This was strengthened by the fact that parking garages were not finished when the first residents moved in, thus they could not park their cars where they were supposed to (Selzer and Langendorf, 2019). Selzer (2021) shows that car-owners complied with the limited parking system once collective garages were open and on-street parking was metered. Those who live car-free support the car-reduced concept.

Kirschner and Langendorf (2020) reveal that support for measures which reduce parking and improve liveability is lowest among car-users. Persons who use sustainable transport frequently support these measures, but to a small extent. It should be noted that their study was in the context of transforming an existing neighbourhood. De Nies (2020) concluded based on a discrete choice experiment that the liveliness of a neighbourhood can increase the willingness of car-owners to move to a car-reduced neighbourhood, but only to a small extent. Parking further away or paying for a parking spot decrease this willingness (De Nies, 2020). However, alternative transport modes were not included in her study. Including them might have a positive effect on the willingness, as people generally support the need for more sustainable transport (Selzer and Langendorf, 2019; Ellder et al., 2022, Kirschner and Langendorf, 2020).

3.2 Sustainable mobility

3.2.1 Strategy

Solely restricting the access for cars to neighbourhoods and/or limiting parking is not sufficient to reduce car-usage. Alternatives must be available and accessible (Leibling, 2014; Selzer, 2021). Alternative modes are public transport, cycling, walking and shared vehicles (Selzer and Lanzendorf, 2019; Baehler and Rérat, 2020; Ellder et al., 2022). Many cities are implementing or planning car restrictions and do this in combination with providing public transport and cycling infrastructure, as well as pedestrian areas (Nieuwenhuijsen and Khreis, 2016). Many different improvements in these are possible (Khreis et al., 2017).

Existing, as well as planned car-reduced neighbourhoods, are usually situated close (within a few hundred meters) to public transport (Baehler, 2019; Selzer, 2021; Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021; Municipality of Delft and marco.broekman, 2019; Rotterdam Makers District, 2019), even though the types of public transport differ. These differences are logical as a result of different public transport networks in these cities, and differences in the location of the car-reduced neighbourhoods. Nonetheless, being situated close to a public transport stop is important, since the longer the distance, the more people will use their car (Ellder, 2020). Several neighbourhoods feature a 'mobility shop' which provides residents with information regarding sustainable travel modes and supports them in using shared vehicles and/or repairing their bikes (Lindlung-siedlung, n.d., Municipality of Utrecht et al., 2021).

3.2.2 Viewpoint potential residents

Improvements in public transport receive the most support from both car-users and persons who live without a car. Melia et al. (2012) found that 47% of the 'car-free possibles' (persons who would like to give up their car under foreseeable and feasible circumstances) are willing to give up their car if public transport is improved. The most important improvements are cost-related (either cheaper or free PT), followed by an increase in supply (Kirschner and Langendorf, 2020). Persons who already live car-free also state that the availability of public transport is very important to them (Melia et al., 2012; Baehler and Rérat, 2020).

Next to public transport, the bicycle is an important means of transport for those who live car-free. 91% of the respondents of Baehler and Rérat (2020) owns at least one bicycle. Safe infrastructure for cyclists and pedestrians, as well as safe and easy parking facilities for bicycles, are preferred by persons who do not travel regularly by car (Baehler and Rérat, 2020; Kirschner and Langendorf, 2020). Gundlach et al. (2018) performed a discrete choice experiment among students in Berlin and found similar results. A car-free city centre in Berlin would be supported by 60% of the respondents. This increases to 90% if public transport becomes free of charge, and 83.8% if bicycle lanes are added to all roads.

The availability of shared vehicles in car-reduced neighbourhoods is preferred as well, but not to the extent of public transport and active modes: only 20% of the residents of car-free neighbourhoods find it very important, compared to 52% and 49% for public transport and active modes respectively. However, 60% of the residents of car-free neighbourhoods make use of shared cars, but usually less than once a month, primarily to transport heavy goods, thus it is being used (Baehler and Rérat, 2020). This is in line with Kirschner and Langendorf (2020), who found that shared vehicles receive less support than public transport and active modes, except by those who use shared vehicles frequently. Nonetheless, Claasen (2020) has shown, based on a discrete choice experiment, that mobility hubs in existing neighbourhoods could reduce car-ownership by 15%.

3.3 Proximity of amenities

3.3.1 Strategy

Having amenities in the neighbourhood is crucial to stimulate the use of sustainable transport, especially walking and cycling (Ellder, 2020; Ellder et al., 2022, De Nies, 2020). Next to this, having amenities nearby and not only in the city centre makes neighbourhoods more liveable (Moreno, 2021). Ellder et al. (2022) investigated the relation between the number of amenities in a neighbourhood (within 1 km from home) and the rate of car-usage and active mode usage. This revealed a statistically significant relation, the more amenities are nearby, the more trips are made with active modes. However, until 150 local amenities, the majority keep using the car, but already at 50 amenities, car-usage has decreased from 90% to 55% in favour of active modes, which increased by 20%.

3.3.2 Viewpoint potential residents

Having amenities nearby is important to residents of car-reduced neighbourhoods (Baehler and Rérat, 2020). 35% of the respondents of Baehler and Rérat (2020) rated it as 'very important' and 39% as 'important'. Having restaurants at 5 minutes walking at most and proximity to the city centre are of smaller importance (Baehler and Rérat, 2020).

Note that Baehler and Rérat used a maximum of 5 minutes walking to many amenities, whereas Ellder et al. (2022) used a distance of 1 km, which requires 12 minutes of walking or 4 minutes cycling (at respectively 5 and 15 km/h). A reduction in car usage for destinations at 5 minutes walking is expected to be much stronger than for 12 minutes walking but having more amenities within 5 min. requires many amenities within a range of 1 km. De Nies (2020) showed that the presence of a supermarket in the neighbourhood positively influences the willingness to live there, but the presence of other amenities negatively influences this willingness. An explanation for this is not given, and it contradicts with Ellder et al. (2022), but the effect is small (De Nies, 2022). The study by Ellder et al. (2022) is based on traffic data of 40.000 respondents over 5 years whereas the study by De Nies (2020) included only 330 persons. This makes it unlikely that the proximity of restaurants negatively influences the willingness to move to a car-reduced neighbourhood.

3.4 Quality of public space

3.4.1 Strategy

The previous sections are primarily about mobility: reducing the car by restrictions, and stimulating the use of sustainable transport modes by providing and stimulating them. If less space is consumed by cars, either as a result of a reduction in car-usage or in neighbourhoods in which little space is planned to be used by cars, space can be used for other functions. Multiple studies agree that more green is needed in cities to improve health and liveability, and that especially space which is nowadays used by polluting cars should be used for this (Nieuwenhuijsen and Khreis, 2016; Nieuwenhuijsen, 2020; Mueller et al., 2017; Gössling, 2020). Green in cities has many benefits:

1) It improves both the physical and mental health of residents, amongst others because green spaces stimulate physical activity and because it reduces air pollution (Lee and Maheswaran, 2011; Nieuwenhuijsen and Khreis, 2016; Mueller et al., 2017).
2) It stimulates interaction amongst people (Nieuwenhuijsen and Khreis, 2016; Moreno, 2021).
3) It stimulates the use of active modes (Glazener and Khreis, 2020), which also improves health and stimulates interaction compared to other transport modes.
4) It can reduce the effects of urban heating and thereby improves liveability (Mohajerani et al., 2017; Erlwein and Pauleit, 2021).

Green can be available in many forms: amongst others large parks, small parks, green roofs and green facades. When it comes to parks, large parks are more likely to attract persons than small parks, because they usually allow more different activities (McCormack, 2010; Giles-Corti, 2005). Urban visions of multiple car-reduced neighbourhoods revealed that much green should be present in them (Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021; Municipality of Delft and marco.broekman, 2019; Rotterdam Makers District, 2019). The urban vision of the Merwedekanaalzone in Utrecht even states that public spaces as well as roofs have to become green unless space is required for different purposes (Municipality of Utrecht et al., 2021).

3.4.2 Viewpoint potential residents

Kirschner and Lanzendorf (2020) show that transforming parking spots into areas which improve liveability receives support, but primarily from respondents who do not use the car frequently. However, support is not as much as measures related to alternative sustainable transport modes. This is in line with Gundlach et al. (2018), where the addition of recreational areas received support, but improvements in public transport and bicycle infrastructure had a larger effect on the preference for car-reduction measures.

3.5 Reducing car-ownership

One of the reasons municipalities plan car-reduced neighbourhoods is to reduce car-ownership. Melia (2014) gives percentages between 10 and 62% of the households who relinquished their car after relocating to a car-reduced neighbourhood. Selzer (2021) shows that multiple households lived car-free before relocating to a car-reduced neighbourhood. Some households gave up their second car, because of the location of the neighbourhood, accessibility by foot and bicycle and public transport infrastructure. However, many kept their first car (Selzer, 2021). Christiansen et al. (2017a) reveal that reducing the number of parking spots and increasing the distance between residence and parking reduces car-ownership compared to on-street parking in front of one's house.

Relocation, amongst other life-events, is a moment when people are likely to change their mobility behaviour (Clark et al., 2016; Aguilera and Cacciari, 2020), even though a discussion exists regarding the causality. Some authors argue that people choose a new residential location based on their transport preferences, which implies that they travel as preferred after their relocation (Van Wee, 2009; Mokhtarian and Cao, 2008). However, other authors argue that they adapt their travel behaviour based on the characteristics of the new residential location (Cao et al., 2007; Guan et al., 2019; Van de Coevering et al., 2016). Nonetheless, relocating to a neighbourhood with good connections by high-quality public transport reduces car-usage and car-ownership (Clark et al., 2016). This applies especially to neighbourhoods in the centre where households have good access to destinations without using the car (Bohnet, 2007; KiM., 2022a). This also indicates that providing a diverse range of amenities in the neighbourhood is likely to reduce car-ownership. Lastly, Liao et al. (2020) and Claasen (2019) reveal that the availability of shared vehicles can reduce car-ownership with respectively 20% and 15%.

This section gave a brief overview of how different characteristics and policies influence car-ownership. Nonetheless, a set of policies is required to reduce car-ownership (Leibling, 2014; Buehler et al., 2016), not just single measures. Besides, other factors such as attitudes also influence car-ownership, thus hard policies should be combined with other more attitude-changing policies (De Vos et al., 2012; Buehler et al., 2016).

3.6 Conclusion

This overview has given insight into different characteristics of car-reduced neighbourhoods, and how those characteristics contribute to better liveable neighbourhoods and cities. Multiple forms of car-reduced neighbourhoods exist, ranging from neighbourhoods where only marking limitations apply to completely car-free neighbourhoods. Some support for car-reduction measures exists, but primarily amongst those who do not frequently use a car. If a neighbourhood limits the use of cars, alternatives must be present. However, reducing car-usage should not only be done by restrictive measures. Providing amenities in the neighbourhood itself stimulates the usage of active modes instead of the car, whereas it does not require restrictive measures. Lastly, green can stimulate the use of active modes as well. However, the main reason to provide green in a neighbourhood is not directly because of mobility itself, but because it improves health, air quality and liveability.

Even though support for car-reduced neighbourhoods exists, cities as well as society remain largely focussed on the car (Selzer and Langendorf, 2019). This makes car-reduced neighbourhoods on one hand 'special', which attracts some residents, but on the other hand, it reduces the proposed car-reduction of car-reduced neighbourhoods, because many destinations are still focussed on the car (Selzer and Langendorf, 2021; Christiansen et al., 2017b). Current young adults seem to be more open to new concepts such as sustainable mobility (Gundlach et al., 2018; Puhe and Schippl, 2014) and the car has become of less importance to them (Selzer, 2021; Puhe and Schippl, 2014). However, the car is still associated with freedom and autonomy and young adults still expect to use the car in the future more often (Puhe and Schippl, 2014). This also implicates that they prefer to be able to park their car nearby, as is common nowadays (Selzer, 2021).

4. Interviews with experts

Interviews have been held with experts from several municipalities, companies and Delft University of Technology. The purpose of these interviews was to discuss car-reduced neighbourhoods from multiple perspectives to broaden the perspective of the author. The background of the author is mainly in mobility, whereas a liveable neighbourhood is much more than residences which are supported by the mobility system. Experts with another background can inspire the author to include different attributes or attribute levels.

4.1 Interview set-up

Because the purpose of these interviews was to broaden the perspective of the author, they were not set up as a list with questions which had to be answered during the interview. That would allow hearing different answers from different perspectives to the same question, but it would barely allow gaining new insights.

Instead, some general questions were asked, with the aim to talk further about different characteristics of car-reduced and/or liveable neighbourhoods. These are given below:

1) What kind of traveller are you? *This gives some insight into the attitude of the expert regarding transport modes and especially the car. Someone who uses the car a lot is likely to think differently than someone who travels knowingly with other modes than the car.*
2) Many municipalities are planning to reduce the presence of cars. Some do this by reducing through traffic only, others (plan to) develop car-reduced or even car-free neighbourhoods. What do you think about these developments? *This gives further insight into the opinion of the expert regarding car-reduction policies and allows to discuss whether they are needed and successful.*
3) One of the main reasons for car-reduced neighbourhoods is to improve liveability, which is a broad concept. What is required to make a neighbourhood liveable? *Answers to this question can be used to choose attributes regarding liveability.*
4) If the number of cars in a neighbourhood decreases, space can be used for other purposes. How would you use this space? *Answers to this question can also be used to create attributes which are related to the quality of public space in a neighbourhood.*
5) What is required to seduce people to relocate to car-reduced neighbourhoods? *Different persons will have different aspects which attract them to a neighbourhood. However, even though this is subjective, experts can answer this question from their perspectives.*

Because all experts are in some way related to real projects, they are, during the conversation, asked for examples of projects which are related to the discussed topic, especially if projects could be used as inspiration for the attributes.

The following sections elaborate on the results of the interviews. As it were conversations, the results are structured by subject, and not in the same order as the questions mentioned above, as that would result in a chaotic overview.

4.2 Physical measures

The main reason why municipalities want to reduce car-presence is to create space for other purposes, especially green. Nonetheless, methods to do this differ, which is partly caused by differences in the spatial structure of municipalities. A common method, which was also mentioned in the literature review, is parking regulation, which is used by many municipalities. Parking regulation can be combined with reducing the parking norm[3], as this would increase the burden to park the car. However, it could also lead to cars which are parked outside parking spots, which eliminates the proposed effect of the lower parking norm

[3] The number of provided parking spots available per house.

was stated by one of the experts. Besides, both parking regulation and a lower parking norm can lead to an increased number of parked cars in adjacent neighbourhoods, reducing their liveability.

Another method is parking at central locations. For example, both Amersfoort and Zwolle are reducing car-presence in the inner-city by creating central parking locations outside this area or even outside the city. Separating parking and residence is more likely to reduce car-usage than parking regulation according to a mobility expert from Arcadis. This is because separation enlarges the threshold to use the car; it becomes easier to use sustainable forms of transport if they are available.

All experts agree that a shift from the car towards sustainable transport modes is necessary. Active modes (walking and cycling) are most important to reduce car-usage, combined with public transport and shared mobility. Regarding the latter, mobility experts expect this to remain smaller than the other sustainable transport modes. The type of shared vehicles depends on the context, but the shared electric transport bike and car seem most promising in reducing the usage of private cars according to experts from both engineering companies and the municipality of Nijmegen. Other shared modes, such as normal (electric) bicycles and mopeds are mainly suitable as egress mode, and not as a mode to travel from home to a destination. Therefore, mopeds were not included in the choice experiment and bicycles were only in combination with electric bicycles.

4.3 Change in behaviour

It is not only about the physical context, but also about the societal context. As long as cars are as normal as they are today, a shift towards shared vehicles might be hard, whereas once more people start to use shared vehicles, they might become normal, and thereby a real alternative to the private car. In other words, a behaviour change is required to reduce the usage of the private car. This was acknowledged by all interviewed experts. Physical measures, such as separating parking and residence, can be used to stimulate this behavioural shift but other methods have to be used as well. These include amongst others campaigns to show which sustainable modes are available and that they are able to replace the private car. Next to that, employers can be stimulated to stimulate their employees to work from home or use sustainable transport modes.

4.4 Societal context, green and amenities

When designing a car-reduced neighbourhood, or deciding upon measures to reduce car presence in existing neighbourhoods, it is important to take the societal context into account. This was primarily mentioned by urban planners (both from Arcadis and the TU Delft). Different types of persons might have different preferences and react differently to measures. This can be influenced by socio-demographics such as income, but also by culture. As a result of this, there is not a single type of neighbourhood which will be liked by everyone. Some residents would prefer having many shops nearby, whereas others want to have a primary school. Nonetheless, having a supermarket nearby is generally seen as more important; walking or cycling a few minutes longer to a restaurant or theatre is generally not seen as a problem. Green is also a very important element in liveable neighbourhoods. This was acknowledged by all experts. One of the experts mentioned pocket parks as a successful method to create green in urban environments at locations with little space. Various urban planners stated that the value of green increases if it allows activities such as playing in a playground, relaxing under some trees which create shadow on a hot day or growing vegetables in a neighbourhood garden. Similar to amenities, the type of activities also depends on the residents. Taking the societal context into account is broader than designing for certain societal groups, based on their preferences. It is also designing with the people. Involving (future) residents in the process could ease the process, and make it easier to increase the usage of sustainable transport modes. This was also mentioned by several experts.

4.5 Time

An aspect which was mentioned by multiple urban planners is time. It is important to realise that a neighbourhood is not only intended for the next few years, but for multiple decades or even a century. During this period, preferences and (transport) behaviour might change, which should be taken into account. This is also a remark to this study, as this study looks into the preferences of people who live today.

4.6 Conclusion

As intended, a broad range of topics related to car-reduced neighbourhoods was discussed with the experts. Multiple aspects are used in the design of the discrete choice experiment. The interviews have shown the importance of alternatives for the car when reducing car-usage. Shared vehicles are one of these. Especially the shared car and electric transport bike are important and are, therefore, alongside normal electric bikes, included in the discrete choice experiment.

The main focus of the interviews was however not on mobility, but on creating a liveable neighbourhood in general. Pocket parks are a good opportunity to create green in an urban environment, and are therefore also used in the discrete choice experiment. Next to that, experts have shown the importance of activities in public space. Even though differences exist between persons, facilities for children were seen as important. Therefore, playgrounds and outdoor sports facilities are included. Also benches are included as these allow people to sit down and have a chat. Lastly, different amenities were discussed, which showed that, even though many amenities could be present, some are more important than others, which resulted in not including leisure and healthcare. Other discussed elements from the interviews were not included in the choice experiment, but are still valuable to keep in mind.

5. Survey design and data collection

A survey is the primary source of data for this study. This chapter describes which data is collected via the survey, and how the survey is distributed.

The survey is constructed in Qualtrics, under a license of Delft University of Technology. Qualtrics is software to create digital surveys.

The survey has 8 parts. The primary part is the discrete choice experiment, as this is used to determine preferences. Nonetheless, the other parts are important as well, as they allow to specify preferences of different persons.

1. Introduction
2. Transport behaviour and preferences regarding the type of residence and mode choice
3. Attitudes including filter-questions
4. Discrete choice experiment, including questions related to relinquishing the car
5. Socio-demographic data
6. Closing

Sections 5.1-5.5 give insight into the different parts of the survey. Section 5.6 briefly explains how the survey was tested. The following section, 5.7, elaborates on the collection of respondents. Lastly, section 5.8 elaborates on the expected outcomes of the survey, regarding the attributes.

5.1 Discrete choice experiment

5.1.1 Selection of attributes and attribute levels

The literature review gave an overview of the characteristics of car-reduced neighbourhoods. These are divided into eight attributes:

1. Access to streets
2. Distance to parking
3. Available public transport service
4. Available shared mobility services
5. Distance to transport services
6. Amenities within 6 minutes walking
7. Type of green in the neighbourhood
8. Amenities in public space

The following paragraphs elaborate on the individual attributes. An overview of all attributes and their levels can be found in section 5.1.1.9.

5.1.1.1 Access to streets

One of the main features of car-reduced areas is that public space is no longer based on the car, with other functions (e.g. walking, green) using the remaining space. In some car-reduced areas, cars still have access to drop off/pick up goods, whereas they are not allowed in other car-reduced (in that case car-free) neighbourhoods.

This attribute has three levels. Level 0 is similar to many existing streets, where the car has full access. Level 1 is similar to a 'woonerf' or bicycle street, where cars are allowed, but as guests with a low speed. This, in combination with remote parking, can also imply that cars have access to drop off something close by the house of the driver, after which the car is parked somewhere else. At level 2, cars do not have access anymore, thus the street is car-free.

Table 5.1, attribute levels for access to streets

Level	Attribute level	Code	
0	Cars, with 30 km/h	1	0
1	Cars with 5 km/h	0	1
2	No cars allowed	0	0

5.1.1.2 Distance to parking

Parking requires a lot of space. Therefore, car-reduced areas feature measures to reduce parking in the form of parking regulation and/or parking at central locations. The latter has been included in the discrete choice experiment since parking in garages at central locations reduces space consumption. Parking regulation as an individual measure does not do this and it is not sufficient to reduce car-usage and -ownership (Leibling, 2014; Selzer, 2021). Besides, including both would make the choice sets even larger and thereby more complicated.

Distances are chosen such that they are suitable for both this attribute, as well as the attribute including the distance to transport services (public transport and shared mobility). Level 0 represents the situation where one can park his car at a very short distance, at a negligible walking time (<1 min). This low distance is seen as mandatory, to be able to compare to the current situation. Level 1 has a walking distance of 300m, which is about 4 minutes walking. This distance is similar to the distance in existing and planned car-reduced neighbourhoods (Lincoln, Darmstadt; GWL-terrain, Amsterdam; Merwdekanaalzone, Utrecht; Sluisbuurt, Amsterdam, Schieoevers-North, Delft). However, it is already longer than the maximum acceptable walking distance from home to parking according to the CROW (2021, table 8.4/2). The highest level, 2, has a walking distance of 600m, which takes 8 minutes. This is much larger than the maximum walking distance in planned car-reduced neighbourhoods but reveals whether people are willing to walk this distance.

In the survey, distances were given in both time and distance, to make it better understandable. A walking speed of 4.5 km/h has been used. This is slightly lower than the usually used speed of 5 km/h. 5 km/h is relatively fast (CROW, n.d.), considering elderly and people who for example carry goods from their car to their home.

Table 5.2, attribute levels for walking time to car

Level	Attribute level	Code	
0	<1 minute walking	1	0
1	4 min walking to car (300m)	0	1
2	8 min walking to car (600m)	0	0

5.1.1.3 Available public transport services

The proximity of public transport is crucial for residents of car-reduced neighbourhoods. Baehler and Rérat (2020) showed that 52% rate the proximity of a bus or tram stop as very important, whereas 45% rate it as (rather) important. These values decrease only slightly in the case of a train station. The availability of public transport is also seen as important in many municipal visions (Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021).

The three levels indicate available public transport services. They are cumulative, which allows estimating the added value of the individual modes. Of course, other combinations than those stated in these levels are possible as well. For example, train stations without a tram stop are common. However, removing the tram from level 2 to account for common situations would lower the possibility to say something about the added value of a train over a tram.

Several characteristics of these modes are not included, as they would increase the number of attributes in the choice sets. For example, the frequency, travel time to a transfer station and costs have influence. Therefore, a statement is made to provide respondents with this information. They can expect a frequency of at least 4 times/hour, an in-vehicle time of 10 minutes and costs as today. Respondents who barely use public transport might have a biased idea of the current costs. However, this bias is expected to have little influence on the weight of public transport.

Table 5.3, attribute levels for public transport

Level	Attribute level	Code	
0	Bus	1	0
1	Bus + Tram	0	1
2	Bus + Tram + Train	0	0

5.1.1.4 Available shared mobility services

Shared cars are present in multiple car-reduced neighbourhoods (Stadtteil-Vauban, n.d.; Selzer, 2021; Lincoln-siedlung, n.d) and are valued by inhabitants of them (Baehler and Rérat, 2020). Many municipalities also plan to implement shared vehicles to reduce car-usage (Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021).

Three levels are used in this study, with no shared vehicles at the first level, only a shared car at the second and in addition to that also electric (transport) bikes on the third level. Other forms of shared vehicles, such as mopeds, are available as well in many cities, but are not included in this attribute, as it is expected that they are less relevant for a trip to/from home. The shared car and electric transport bike are seen as the best replacement for the personal car. Therefore these are included.

Table 5.4, attribute levels for available shared vehicles

Level	Attribute level	Code	
0	No shared vehicles	1	0
1	Shared car	0	1
2	Shared car, and electric (transport) bikes	0	0

Several characteristics of shared vehicles are ignored in this study. This includes the costs, availability at the moment when one wants to use it, the type of reservation system, and more details about the vehicles (e.g., the size of the car). Including these characteristics would require much more attributes, which makes the survey not doable. For the survey, it is assumed (and as such explained to respondents) that shared vehicles are available at the moment someone would like to use them for a price that persons would accept.

5.1.1.5 Walking time to transport services

The distance to transport services is combined in a single attribute. Using individual attributes for both public transport and shared vehicles would require an additional attribute, and make the choice-set more complicated. Next to that, multiple car-reduced neighbourhoods feature mobility-hubs, where both public transport and shared vehicles are available. However, as a result of using only one attribute for the walking time, no differences between the preferred walking time to public transport and shared vehicles can be revealed.

Attribute levels are similar to those for walking to parking, to allow an easy comparison. Level 0 has a negligible distance (<1 min). Regarding public transport, this might be hard to realise in practice, except for apartment buildings with the entrance close to a public transport stop. For shared vehicles, this small distance is easier to realise. Level 1 is within the range as specified by the CROW (2021, table 8.4/2): people accept a walking distance of 200-500m to a local bus and 100-350m to a shared car. Level 2 is slightly beyond these ranges. However, this distance is still much smaller than the acceptable distance to a train station. The CROW (n.d.) mentions multiple studies on the acceptable walking distance to a train station. These vary between 760m and 2200m, although most studies mention 1000m. Next to that, people might also cycle instead of walk.

Table 5.5, attribute levels for walking time to transport services

Level	Attribute level	Code	
0	<1 min walking (<80m)	1	0
1	4 min walking (300m)	0	1
2	8 min walking (600m)	0	0

5.1.1.6 Amenities

The availability of amenities at a small distance reduces the probability that residents use their car, as walking or cycling might be easier. This attribute describes which amenities are available within 5 minutes of walking (400m). The CBS (2019) distinguishes eight categories of amenities: healthcare, shops, catering, day-care, education, green, transport and leisure and culture.

Six categories remain when excluding green and transport, as those are described in other attributes. It is impossible to describe them all in a single attribute. However, for leisure and culture, it is assumed that people do not mind travelling slightly further. This was also acknowledged by experts during the interviews. The dataset of the CBS includes multiple levels of education, it is assumed that the proximity of a primary school is more important than secondary or higher education. This complies with spatial plans of multiple car-reduced neighbourhoods, in which usually one or more primary schools are present (marco.broekman, 2019; Municipality of Utrecht et al., 2021; Municipality of Amsterdam, 2017, Lincoln-siedlung, n.d.), whereas the number of secondary and higher education remains smaller. It is assumed that preferences for daycare are similar to those for primary schools. Lastly, it is assumed that the availability of healthcare has a relatively low influence on the residential location choice (Guo and Peeta, 2020).

As a supermarket and primary school are present in multiple urban plans for car-reduced neighbourhoods, these form level 0. Level 1 adds (non-) food shops to this and the next level also restaurants and cafes. This reveals the added value of (non-) food shops and restaurants. However, the individual weight of supermarkets and primary schools cannot be deduced. An alternative would be stating that the level of amenities in a neighbourhood is similar to a certain type of neighbourhood, such as the city-centre (thus with many different amenities), neighbourhoods just outside the centre (still diverse amenities) and neighbourhoods with mainly a residential function (with only a few amenities). This would still require a description of what can be found in every type of neighbourhood.

Table 5.6, attribute levels for amenities within 5 minutes walking.

Level	Attribute level	Code	
0	Supermarket Primary school	1	0
1	Supermarket Primary school (Non-) food shops	0	1
2	Supermarket Primary school (Non-) food shops Restaurants	0	0

5.1.1.7 Liveability of the neighbourhood

Creating liveable neighbourhoods is one of the main reasons for municipalities to develop car-reduced neighbourhoods. Liveability is a broad concept. It includes among others education, welfare, ability to play and sport, health and culture (Municipality of Utrecht, 2020; The Economist Intelligence Unit, 2021). Scoping to public space, spatial visions usually mention air quality, presence of green, and locations to relax and interact with other people. These are included in this study and divided over two attributes, each having three levels. Air quality is not explicitly included, but it is related to green, as this is able to improve air quality.

The first attribute focuses on the type of green. Green in the neighbourhood is an important aspect to make the neighbourhood liveable. It is not a question whether green will be present in car-reduced neighbourhoods, as it is included in many spatial visions. The importance of green is also acknowledged by experts during interviews. Therefore, all levels contain green in streets, but with a different distribution. Levels 0 and 1 contain some green in streets, but have additional green in respectively multiple small parks and a large park. Level 2 does not feature a park, but much green in streets.

Table 5.7, attribute levels for type of green in the neighbourhood

Level	Attribute level	Code	
0	Some green in every street and multiple small parks	1	0
1	Some green in every street and a large central park	0	1
2	Much green in every street, but no additional park	0	0

The second attribute focuses on social aspects of liveability, which take place in public.

There are many options for amenities in public space which stimulate interaction, and these can complement each other. Therefore, three cumulative levels have been used. Level 0 contains benches, which allow people to sit down and chat or rest. The next level also contains playgrounds. For example in the Merwedekanaalzone, playgrounds throughout the entire neighbourhood are seen as an important characteristic of the neighbourhood (Municipality of Utrecht et al., 2021). The last level adds outdoor sports facilities, such as a small football field or equipment for strength training. These benches, playgrounds and sport facilities can be combined with green, which makes them space efficient: space is used for nature, relaxing and interaction between residents.

Table 5.8, attribute levels for amenities in public space

Level	Attribute level	Code	
0	Benches	1	0
1	Benches and playgrounds	0	1
2	Benches, playgrounds and outdoor sports facilities	0	0

Water in public space, whether this allows swimming or not, would also contribute to the value of public space and mitigate urban heat islands (Gunawardena et al., 2017). However, water was not included because it is usually combined with green. Next to that, it would make the choice-sets even more complicated when an attribute for water would be added.

Table 5.9, overview of all attributes and their levels.

Attribute	Attribute levels		
Access for cars	With 30 km/h	With 5 km/h	No access
Walking distance to parking from home	<1 min (Car close to home)	4 min (300 m)	8 min (600 m)
Available transport services	Bus	Bus + Tram	Bus + Tram + Train
Available shared mobility	No shared vehicles	Shared car	Shared car and electric (transport) bike
Walking distance to transport services	<1 min (stop close to home)	4 min (300m)	8 min (600m)
Amenities within 5 minutes (400m) walking	Supermarket Primary school	Supermarket Primary school (Non-)food shops	Supermarket Primary school (Non-food) shops Restaurants
Green in the neighbourhood	Some green in every street and multiple small parks	Some green in every street and a large central park	Much green in every street, but no additional park
Amenities in public space	Benches	Benches Playgrounds	Benches Playgrounds Outdoor sports facilities

5.1.1.8 Overview of attributes and attribute levels

Table 5.9 gives an overview of all attributes and their levels.

5.1.2 Construction of profiles and choice sets

As explained in section 2.3.2, this study makes use of an orthogonal design. The set of attributes, 8 attributes with 3 levels, results in 27 choice sets (Molin, 2017). These are divided in three blocks of nine choice sets, to limit the number of choice-tasks per respondents. Approximately 10 choice sets per respondent should be doable (Bahrampour et al., 2020; Molin, 2021).

5.2 Reduction in car-ownership

The main goal of this study is to give more insight in the importance of different characteristics of a neighbourhood when people consider moving to a car-reduced neighbourhood. However, an important characteristic to municipalities as well as other parties involved in the development of residential areas is the parking norm (number of parking spots per household). For layman, this number is too vague to include in a survey. Nonetheless, it is interesting to know whether people would be willing to give up their car, when moving to a car-reduced neighbourhood. This is estimated by asking respondents whether they would be willing to do this, in case they moved to a neighbourhood with certain characteristics. Characteristics are chosen such that it is relatively likely that persons might give up their car. Respondents can state the likelihood that they would give up their car when moving to that neighbourhood via a Likert scale. The likelihood that persons want to give up their car is expected to be small. Therefore, it is expected that the percentage of persons giving up their car is lower in case of a neighbourhood with worse characteristics.

Another option would be to ask respondents for every choice in the discrete choice experiment whether they would give up their car. That would give more insight in which attributes increase the willingness to give up a car. However, because many respondents are expected not to be willing to do so, these questions would increase the burden of answering the survey, which increases the risk that respondents do not complete it.

5.3 Attitudes and preferences

Although socio-demographics are primarily used in the development of neighbourhoods, they are not the only aspects influencing behaviour. It is also influenced by attitudes and preferences (Van Wee et al., 2022; Mokhtarian and Cao, 2008; Van Acker et al., 2010). Therefore, also attitudes are collected via some a number of statements. This reveals amongst others the importance of the car to respondents.

Also a few questions are included where respondents have to express their preference for a transport mode, and for the type of residence (see table 5.10). Next to that, some statements determine the attitude of respondents regarding different aspects of the neighbourhood (table 5.11) The number of questions related to this is small, as the practical application is much smaller than that of socio-demographics.

Table 5.10, questions which ask for attitudes and preferences of respondents

Statement	Background
The car gives me a feeling of freedom	Persons who are car-oriented, and thus less likely to relocate to a car-reduced neighbourhood, are expected to attach more value to the freedom of a car, because they do not know the freedom other modes give.
I only use the car when it is really necessary	Persons who agree with this statement are expected to be reluctant regarding car-usage, which increases the likelihood that they do not mind walking further to their car. However, car-oriented persons might call their usage of the car also necessary, while other options exist.
I would only relocate to a house where I can park my car directly next to/in front of my house.	Filter question. Persons who strongly agree are not likely to move to a car-reduced neighbourhood. Therefore, they are excluded from the survey.
I like living in a neighbourhood with few cars on the street	Persons who agree with this are expected to be more willing to live in car-reduced neighbourhoods.
Having much green in my neighbourhood is important to me	Persons who agree with this statement are expected to give a high value to the presence of green in the neighbourhood.
I like having a diverse range of amenities in my neighborhood, such as shops, schools and restaurants.	Persons who agree with this are expected to value neighbourhoods with many amenities high.
I would consider relocating if my street were made greener, and if this would result in walking a few minutes to my car.	Filter question. Persons who strongly agree are not likely to remain in a neighbourhood which is transformed from car-included to car-reduced. Therefore, they are excluded from the survey.
Preference	**Background**
Preference for a mode to travel to an activity (work, education, daily groceries, shopping, recreation)	Persons who prefer to use their car are expected to be less open towards car-reduced neighbourhoods. On the other hand, persons who prefer other modes are expected to be open.
Preference for type of residence, if moving to a car-reduced neighbourhood	This is mainly useful for recommendations based on this study.

5.4 Socio-demographic characteristics

Respondents are asked to provide several socio-demographic characteristics. Knowledge about these characteristics is useful because neighbourhoods are usually designed for a mix of household types, such as starters, families and elderly.

This data is used to determine whether differences exist between different socio-demographic groups. Socio-demographic data which is asked is presented in table 5.12.

Table 5.11, requested socio-demographic data

Type of data	Background
Age	This allows to investigate whether choice patterns differ amongst age groups. Young persons are expected to attach more value to the availability of public transport (Puhe and Schippl, 2014).
Income	This allows to investigate whether choice patterns differ amongst income groups. A higher income has a positive impact on car-ownership (Christiansen et al., 2017a).
Education level	This allows to investigate whether choice patterns differ amongst persons with a different education level. Higher educated respondents are expected to be more open to a reduction of cars in public space.
Type of household **Number of children below the age of 12**	These characteristics enable the possibility to take different households into account, and the influence of having children on preferences. On one hand, families with children are more likely to own a car (Christiansen et al., 2017a), and are expected to prefer to park the car close to their house, such that they do not have to walk a long distance with their children. On the other hand, not allowing cars to the street increases safety for children playing on them. It is expected that preferences of households with children younger than 12 years differ from households in which all children are older than 12. For example because young children still play at the street.
Postal code (only numbers)	This allows to test whether differences exist between inhabitants of different cities and neighbourhoods.
Main daily activity	Can be used to give insight between persons who perform different daily activities, e.g. working persons, students and persons who do not work. The number of options for this question should be kept limited, as not all daily activities are used in the development of a neighbourhood (for example, a neighbourhood can be developed for students, but not for persons who do voluntary work).

Table 5.12, requested data regarding travel behaviour

Type of data	Background
Number of cars in household	It is expected that the more cars are in a household, the less open the respondent will be towards a reduction of cars in public space.
Plans to buy/sell a car within a year	Households with plans to sell a car might be more open towards car-reduced neighbourhoods, in contrast to persons who plan to buy a car. A period of a year has been chosen as this is easy to oversee
Current walking time to parked car	Persons who are used to walk to their car will be more open to a neighbourhood where they have to walk for some minutes.
Frequency of usage per mode (car, public transport, shared car/moped, walking and cycling)	Persons who use their car a lot are expected to be less open towards car-reduced neighbourhoods. On the other hand, users of other modes are expected to be open.

5.5 Travel behaviour

The residential location choice is subject to residential self-selection. It is influenced by attitudes and preferences regarding, among others, transport (Van Wee, 2009; Van Acker et al., 2010). People with a preference for trains as transport mode, are likely to choose a location near a train station. Even though relocation is a moment when persons change travel behaviour (Van Acker et al., 2010; Clark et al., 2016), current behaviour has influence as well. For example, households with a car are expected to be less likely to move to a car-reduced neighbourhood, than households who live without a car. Because of this, some questions about this are asked prior to the choice experiment. The required types of data are given in table 4.13.

5.6 Pilot survey

The survey has been distributed amongst 30 persons to test whether the survey, and especially the discrete choice experiment, was clear. The pilot was not used for analyses based on the answers of respondents. Persons who were approached for this survey include acquaintances and colleagues of the author, thus respondents were not representative for residents of Dutch cities. Based on the results of the pilot, the survey has been improved to make it better understandable and readable.

5.7 Data collection

5.7.1 Survey distribution

Three cities have been chosen to distribute the questionnaire. These are Rotterdam, Delft and Amersfoort. Rotterdam is the second largest city in the Netherlands and is situated in the Randstad. Delft is also situated in the Randstad, but is smaller, both in size and in number of inhabitants. Amersfoort is situated just outside the Randstad. Using K-means clustering, 28 neighbourhoods have been selected for the distribution of the survey. Appendix B elaborates on the selection of neighbourhoods for the three cities.

Flyers did not state explicitly that the survey would be about car-reduced neighbourhoods, to prevent potential residents from not submitting a response because of attitudes regarding car-reduced neighbourhoods. Respondents could win a €10 or €20 voucher, which should stimulate persons to submit a response.

5.7.2 Select respondents

Persons to whom it is very important to park their car close to their house are not likely to relocate to a car-reduced neighbourhood. Therefore, it is useless to include their preferences for car-reduced neighbourhoods. to exclude persons who are not likely to relocate to a car-reduced neighbourhood. This is done via two statements. Respondents can mention via a Likert scale whether they agree with them.

1. I would only relocate to a house where I can park my car directly next to/in front of my house.
2. I would consider relocating if my street were made greener, and if this would result in walking a few minutes to my car.

Persons who strongly agree with these statements are excluded from the survey.

5.8 Expectations

Before estimating the model, the following table gives an overview of the general expectations. Appendix D gives an overview of all expectations regarding the interactions between characteristics of the choice-maker and attributes. It is expected that attitudes have most influence on the likelihood to relinquish a car.

Table 5.13, General expectations regarding the attributes

Attribute	Expectations
Access for cars	Streets with access for cars are preferred over those without access. Speed is of smaller importance.
Walking time to parking	Shorter walking times are preferred over longer ones (de Nies, 2020)
Available public transport	Neighbourhoods where a tram is available are preferred over those with only a bus because of the 'rail bonus' (a preference for rail over bus if all other characteristics are equal, which is the case in the survey)(Axhausen et al., 2001; Scherer, 2010; Bunschoten et al., 2013).
Available shared vehicles	Neighbourhoods in which shared vehicles are present are preferred over those without (Hurtubia et al., 2021). Nonetheless, this effect is expected to be small, amongst others as shared vehicles are not as common as other means of transport (KiM, 2021).
Walking time to public transport and shared vehicles	A walking time of 4 minutes is preferred over <1 minute and 8 minutes. It is a short walking time, but reduces the risk for nuisance caused by especially public transport.
Amenities within 5 minutes walking	Variety is expected. Some persons will prefer a small amount of amenities, because they prefer a more quite neighbourhood (such as VINEX-neighbourhoods which consist primarily of houses and feature little amenities), whereas others prefer a city centre with many amenities.
Green in the neighbourhood	A preference for neighbourhoods with a park, because these are more likely to offer possibilities for different activities (Giles-Corti et al., 2005; McCormack et al., 2010)
Amenities in public space	Variety is expected, because different groups will have different preferences (for example, elderly prefer benches and persons with children playgrounds). Nonetheless, neighbourhoods with a diverse range of public amenities are expected to be preferred, as it allows multiple different activities (Giles-Corti et al., 2005; McCormack et al., 2010).

6. Results

This chapter gives an overview of the results of this study. First, section 6.1 gives the descriptive statistics of the responses and respondents. This reveals that most socio-demographic groups are represented, but that the distribution of the respondents over these groups differs from the real population of urban areas. Section 6.2 describes the estimation of the model and gives the estimated parameters. Next, section 6.3 elaborates on these parameters and applies them to multiple different household types. Section 6.4 introduces different profiles. Lastly, section 6.5 elaborates on the effects on car-ownership of different characteristics which were included in the survey.

6.1 Descriptive statistics

This section gives an overview of the descriptive statistics of all responses and respondents. First, the statistics of the distribution are given (6.1.1), followed by multiple socio-demographics (6.1.2-6.1.6), car-ownership (6.1.7), transport behaviour and preferences (6.1.8 and 6.1.9), the location of a neighbourhood (6.1.10) and attitudes (6.1.11). These statistics are compared with data from the Netherlands as a whole and different cities (Rotterdam, Delft and Amersfoort), or with data from The Netherlands Mobility Panel (MPN)(Hoogendoorn-Lanser et al., 2015; Hoogendoorn-Lanser and de Haas, 2019). In case of the latter, data from (highly) urban areas has been used. This, as well as the comparison with Rotterdam, Delft and Amersfoort, reveals whether the sample is representative of the population of urban areas. Comparing with solely the Netherlands as a whole would not be useful, since preferences, as well as behaviour in urban areas, are different, amongst others due to longer distances to destinations. The selected cities are not representative of all urban areas in the Netherlands but give an impression. Lastly, section 6.1.12 gives the statistics of all choices made in the choice-sets. This chapter uses graphs with percentages to describe the responses and respondents. Appendix E contains the same data, but in table form, in combination with the number of persons per socio-demographic aspect.

6.1.1 Distribution

In total, around 4,200 flyers have been distributed across 28 neighbourhoods in Rotterdam, Delft and Amersfoort. Because these gave only a small amount of results (125 in the first week, in which about 3,500 flyers had been distributed), the survey was also shared on social media (LinkedIn and Facebook) to gather additional responses. 318 respondents filled in the questionnaire, of which an estimated 200 did this via the flyers (during the first week, 59% of the responses was collected via the QR-code, and thus 41% via the link. Of all respondents, 116 used the QR-code. Extrapolating this results in approximately 200 respondents who used the flyer). Table 6.1 gives an overview of how all responses were collected. This gives a response rate of 4.9%, which is lower than in other studies (Claasen, 2020; de Nies, 2020; Molin and Maat, 2015).

Table 6.1, Overview of how responses were collected

Entered survey via	**First week**		**Total**	
	N	%	N	%
Link on flyer	51	40.8%	84*	26.4%
QR-code	74	59.2%	116	36.5%
Social media	0	0%	118*	37.1%
Total	125	100%	318	100%
	* = estimated number			

Out of the total number of 318 responses, 211 were used for the analysis. 43 persons did not belong to the target group and were therefore excluded: 34 of them would only move to a house where the car could be parked close to and 16 would relocate if they could not park their car close to their home anymore. Another 64 responses were removed because these were not completed. This regarded mostly respondents who did not provide any socio-demographic data, which makes it impossible to account for socio-demographic characteristics.

6.1.2 Age

The sample is largely representative, although the group 27-39 years is strongly underrepresented, whereas the group 55-64 years is strongly overrepresented. This can amongst others be explained by the age of persons who shared the link on social media. Figure 6.1 gives an overview of the distribution of ages amongst the used responses as well as the distribution in three cities. Note that in case of the references, percentages are based on the population of 18 years and older. Data from the references is retrieved from respectively: Municipality of Rotterdam (2022), Municipality of Delft (2022), Municipality of Amersfoort (2022) and CBS (2022a).

6.1.3 Household composition

All household compositions are present in the sample. Nonetheless, the distribution differs from the distribution in reference cities and the Netherlands. Especially couples without children are strongly overrepresented, whereas other compositions are under-represented (See figure 6.2).

Table 6.2, Number of children <12 years in households with children

Number of children <12y	Number of households in sample	Percentage of households in sample
0 (but older children)	28	53.6
1	12	23.1
2	9	17.3
3 or more	3	5.8

In case of a composition which included children, the respondent was also asked how many of these children were below the age of twelve, thus mainly going to primary school. Slightly less than half of the households with children has at least one child below the age of twelve (see table 6.2).

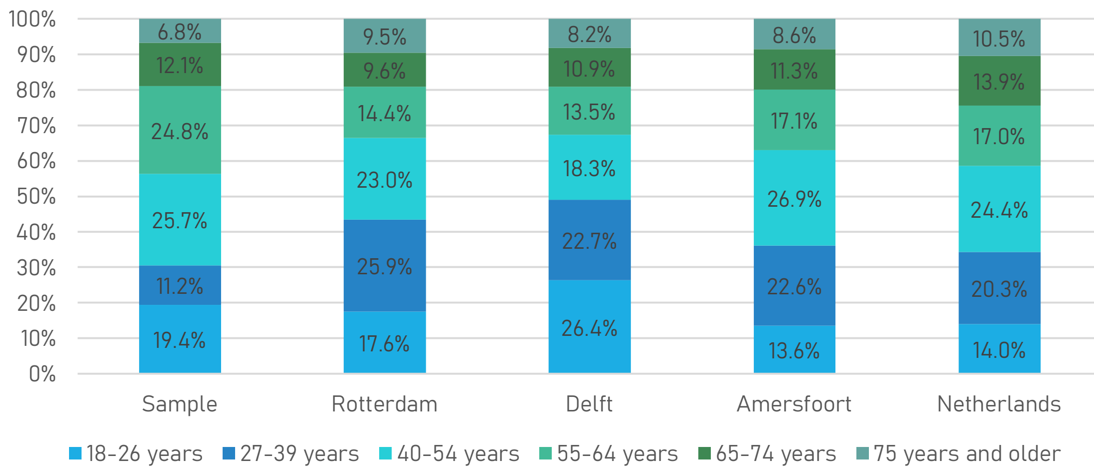


Figure 6.1, Age distribution, percentages for the population of 18 years and older

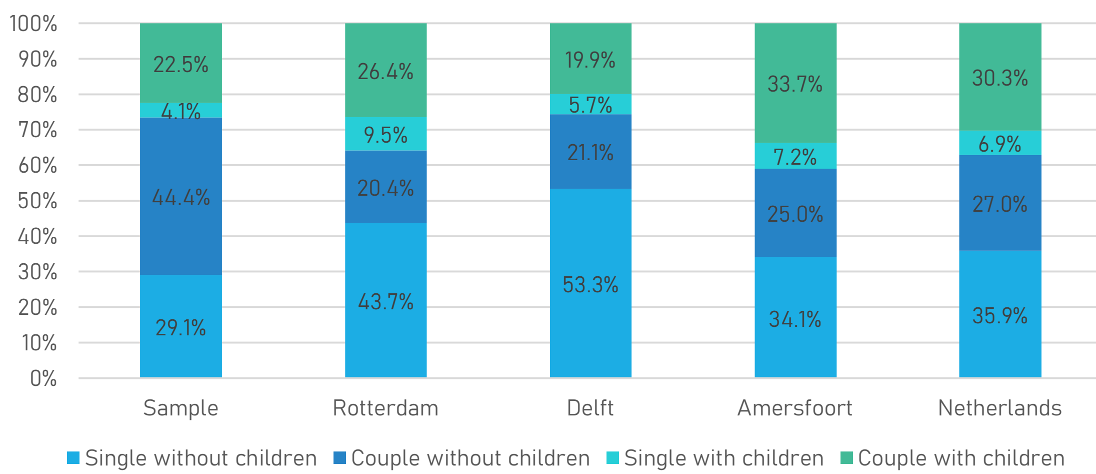


Figure 6.2, Household composition

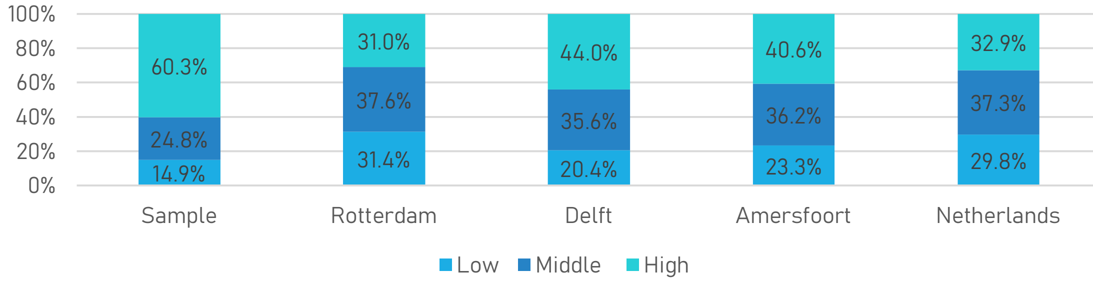


Figure 6.3, Education level

6.1.4 Education level

Table 6.3 gives an overview of the distribution of education levels within the sample, and within Rotterdam, Delft, Amersfoort and the Netherlands in general (references resp.: Municipality of Rotterdam, 2022; Municipality of Delft, 2022; Municipality of Amersfoort, 2022; CBS, 2021b). This reveals that all groups are present in the sample, but that high-educated persons are strongly overrepresented. This can have several causes:

- Higher educated persons are expected to be more willing to fill in the survey compared to lower educated persons.
- Distribution via the network of the author is likely to attract primarily higher educated respondents
- Over 50% of the inhabitants of Rotterdam does not have a Dutch background (Municipality of Rotterdam, 2022). Part of those in Rotterdam who received a flyer might therefore have been unable to submit a response.

6.1.5 Income level

All income classes are represented in the sample, as shown in figure 6.4. Note that percentages are based on respondents who were willing to mention their income (20% of all respondents were not willing to mention their income). Figure 6.5 (next page) compares the income distribution with other cities and the Netherlands as a whole. This reveals that middle incomes are strongly overrepresented at the cost of the other income classes. The smaller share of low-income households compared to Rotterdam and Delft can be explained by the education level of respondents; high-educated persons are more likely to have a high income, and high-educated persons are strongly overrepresented.

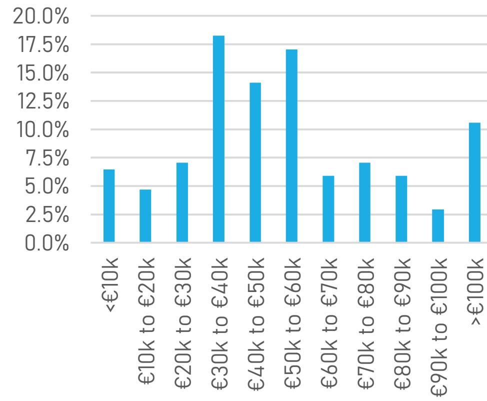


Figure 6.4, Income level of respondents

It should be noted that this study uses different income classes than the references. The cause for this difference is because the CBS defines income classes such that 40% of the Dutch population has a low income, 40% a middle income and 20% a high income. Respondents of this study could state their income per class of €10,000. Table 6.3 gives an overview of the classes used in this study, and in the references (CBS).

Table 6.3, Income levels per income class

Dataset/class	Minimum income	Maximum income
This study		
Low	-	€40,000
Middle	€40,000	€60,000
High	€60,000	-
CBS		
Low	-	€44,100
Middle	€44,100	€106,400
High	€106,400	-

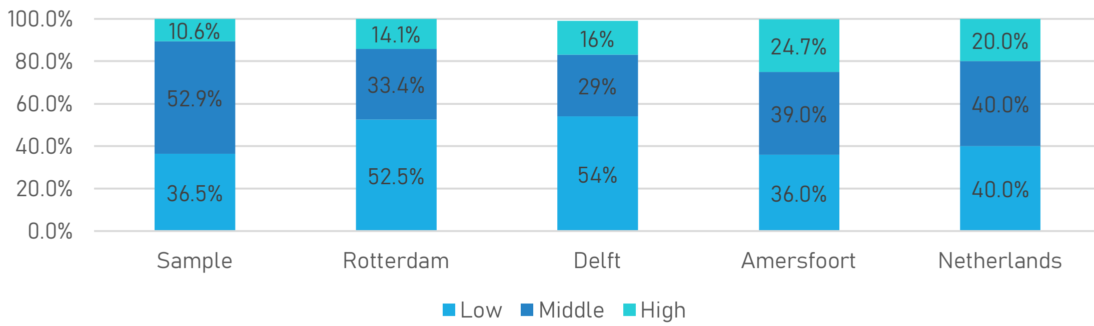


Figure 6.5, Income distribution in sample and references. Note that different classes are used for the sample.

6.1.6 Main daily activity

Most respondents of the survey are employed. However, the share of employed respondents is much larger than in case of the MPN (see figure 6.6). The other main daily activities are, in contrast to employment, (much) smaller, except for unemployment. A possible cause for the large number of employed respondents is the number of available options for the main daily activity. The MPN provides more options (which are in this table combined with 'else'). Respondents who do something else than working might have selected 'working' because they did not want to state 'else'. The answer 'else' in the MPN is a combination of multiple main daily activities, including 'else', but also 'incapacitated', 'houseman/wife' and 'voluntary work').

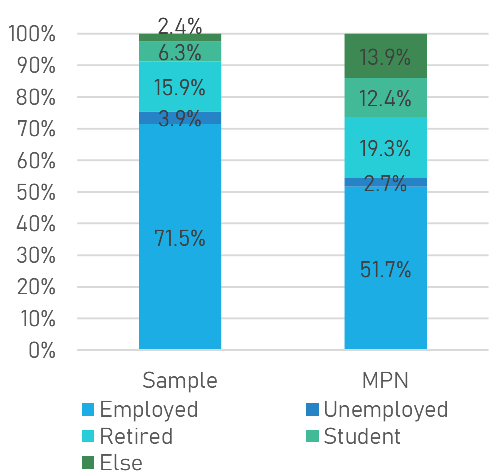


Figure 6.6, Main daily activity

6.1.7 Car-ownership

Car-ownership amongst respondents of this study was found to be similar as in the Netherlands in general (KiM, 2022a)(see figure 6.7), but larger than in cities. The rate of households with 1 car is relatively large, whereas other classes are slightly smaller than in the Netherlands. However, numbers from the Netherlands include both urban and rural regions, whereas this study focusses on cities. No numbers could be found regarding the distribution of number of cars in Rotterdam, Delft and Amersfoort. Nonetheless, the average number of cars per household was found and is given in table 6.4 (CBS, 2022b).

Table 6.4, Cars per household

Location	Cars per household
Sample	1.0
Rotterdam	0.6
Delft	0.5
Amersfoort	0.9
Netherlands	1.0

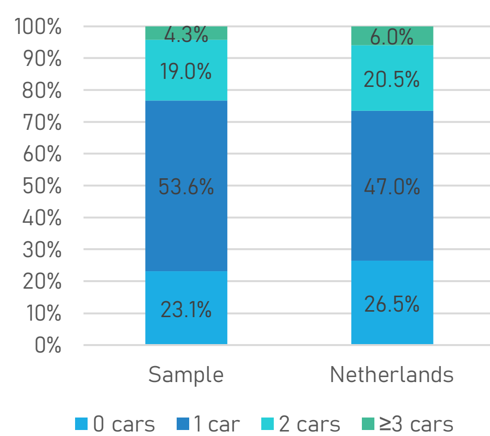
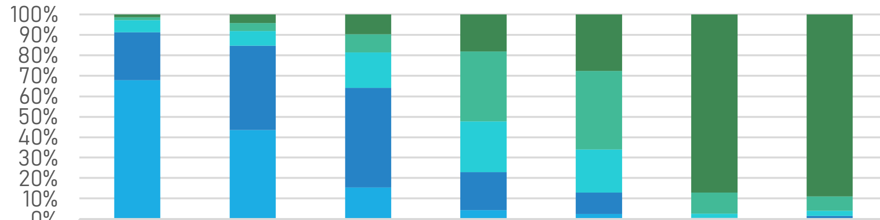


Figure 6.7, Car-ownership amongst respondents

This implies that the number of cars per household is relatively high for an urban area. However, this is not considered to be a problem for this study. Car-reduced neighbourhoods should provide a good residence for both households with and without a car. As car-reduced neighbourhoods are likely to reduce car-usage of car-owners, their effect on car-usage is larger when they are attractive to car-owners, who might reduce their car-usage once they live in a car-reduced neighbourhood. Nonetheless, the results might be biased towards the preferences of car-owners, even though this was taken into account.

6.1.8 Travel behaviour

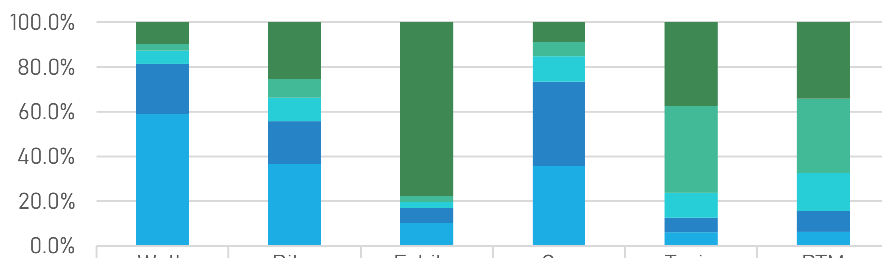
Figures 6.8 and 6.9 reveal the travel behaviour of the respondents of this study and of the MPN (for (highly) urban areas). Note that some differences between the datasets exist. The high frequencies differ slightly (5 or more days (and 1-4 days) a week vs 4 or more days (and 1-3 days) a week. Next to that, available transport modes differ. In this study, the e-bike was not included as an individual mode. In the MPN, shared vehicles were not included. Travel behaviour is especially different when it comes to the usage of the car. Where almost 80% of respondents of the MPN use the car frequently (at least once a week), is this only 52% amongst respondents of this study. Usage of the bicycle



	Walk	Bike	Car	Train	BTM	Shared car	Shared bike/moped
Never	1.4%	4.3%	9.7%	18.1%	27.6%	87.0%	88.9%
Less than 1 day/month	1.4%	3.8%	8.7%	34.2%	38.4%	10.5%	7.0%
1-3 days/month	5.8%	7.2%	17.5%	24.9%	21.2%	2.0%	2.5%
1-4 days/week	23.6%	41.2%	48.5%	18.5%	10.3%	0.5%	1.5%
5 or more days/week	67.8%	43.5%	15.5%	4.4%	2.5%	0.0%	0.0%

5 or more days/week 1-4 days/week 1-3 days/month Less than 1 day/month Never

Figure 6.8, Transport behaviour of sample



	Walk	Bike	E-bike	Car	Train	BTM
Never	9.8%	25.4%	77.7%	8.8%	37.5%	34.2%
Less than 1 day a month	2.9%	8.5%	2.7%	6.4%	38.7%	33.4%
1 to 3 days a month	5.9%	10.5%	2.7%	11.4%	11.2%	16.8%
1-3 days a week	22.6%	19.1%	6.6%	37.8%	6.6%	9.3%
4 or more days a week	58.8%	36.6%	10.2%	35.6%	6.0%	6.3%

4 or more days a week 1-3 days a week 1 to 3 days a month Less than 1 day a month Never

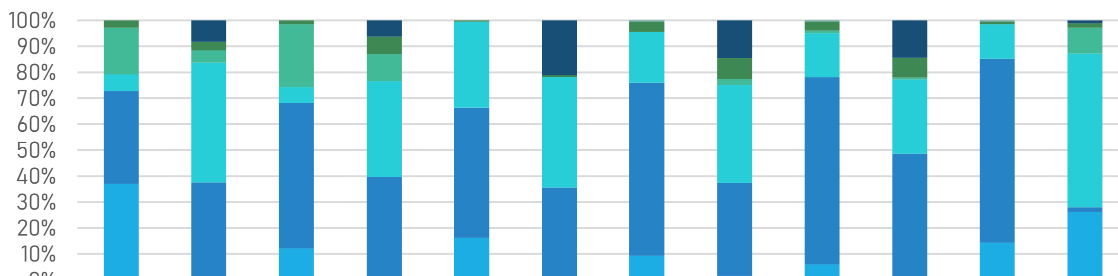
Figure 6.9, Transport behaviour of MPN also differs strongly, but this could be (partly) caused by the e-bike. If users of the e-bike in the MPN do not use a normal bike, the percentage of frequent bike users increases. Nonetheless, active mode usage amongst respondents of this study remains high. Regarding public transport, usage of the train is slightly more in this study, while usage of BTM is smaller compared to the MPN. These differences can partly be explained by the socio-demographics of the respondents: they are usually higher educated. Low-educated persons make relatively more use of bus, tram and metro, even though their trips are shorter than those of high educated persons (Centraal Planbureau and KiM, 2009). An important note to this comparison is the context. MPN data was collected in 2018, before the Covid pandemic, whereas data for this study was collected in 2022, after the pandemic. During the pandemic, it became, especially for higher educated persons, normal to work a few days from home. This could be an explanation why some modes are used with lower frequencies in the sample (KiM, 2021).

Some respondents did not state their usage frequency for all modes (The maximum number of blank answers for a mode was 13, out of 211 responses). It is assumed that they do not use the modes for which no answer was given.

6.1.9 Transport mode preferences

The combination of real and preferred travel behaviour reveals that more than half of the respondents use their car multiple times a week, whereas only a few of them prefer to use it to travel to work. Active modes are very popular, both in actual behaviour and preferences. Shared vehicles are barely used by the respondents. Apart from one respondent, it is never the preferred mode for a trip.

A comparison with the MPN-data (see figure 6.10) reveals that the sample has a much smaller preference for the car, whereas the preference for especially active modes is much larger. Multiple explanations could (partly) explain this difference. First, people who took part in the survey are expected to be (slightly) interested in the topic of liveability and/or sustainable transport, because persons who are not interested in this topic are less likely to take part. Next to that, respondents of this study might choose other modes, because they feel like they have to choose modes other than the car. Another explanation is the effect of Covid. During the pandemic, car-usage decreased strongly KiM, 2021). This could have influenced travel preferences, although the Covid pandemic also let to a shift from public



	Work		Education		Supermarket		Shopping		Restaurant		Leisure	
	Sample	MPN	Sample	MPN	Sample	MPN	Sample	MPN	Sample	MPN	Sample	MPN
Other	0.0%	8.9%	0.0%	6.7%	0.0%	26.9%	0.0%	17.1%	0.0%	16.9%	0.0%	1.2%
Shared bike/moped	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Shared car	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.0%	0.5%	0.0%
BTM	2.9%	3.7%	1.5%	7.2%	0.5%	0.7%	3.9%	9.4%	3.5%	8.9%	1.0%	1.7%
Train	17.9%	5.2%	24.2%	11.1%	0.0%	0.1%	0.0%	2.7%	1.0%	0.9%	0.0%	10.1%
Car	6.4%	50.1%	6.1%	39.5%	33.2%	54.0%	19.7%	44.3%	16.9%	33.3%	13.4%	59.9%
Bike	35.8%	40.8%	56.1%	42.0%	50.2%	43.3%	66.5%	41.7%	72.1%	56.0%	70.8%	1.8%
Walk	37.0%	0.2%	12.1%	0.4%	16.1%	1.9%	9.4%	1.9%	6.0%	0.9%	14.4%	26.5%

Figure 6.10, Preferred transport modes for different trips

transport to active modes and the car (KiM, 2021). This could explain the difference regarding BTM between the sample and MPN, and it also applies to the increase in walking, but not the preference for cars being this much lower.

A consequence of the difference between the two datasets is that the estimations based on the sample are based on persons who are largely not car-minded. They might be much more open to car-reduction policies than people in general, thus this study might make an underestimation of the importance of cars, and an overestimation of other attributes.

6.1.10 Attitudes

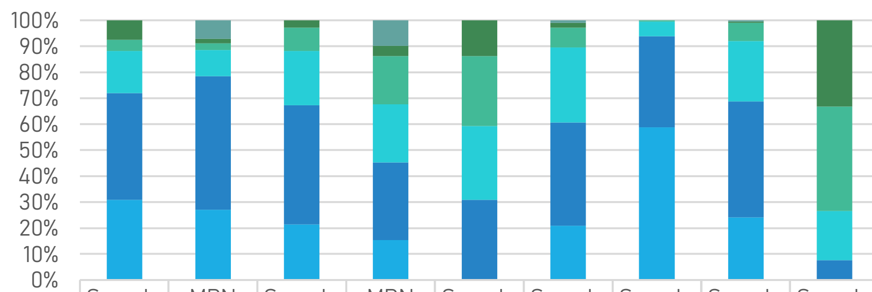
Seven statements were presented to respondents to measure their attitudes regarding several aspects of neighbourhoods. Statements one and two are retrieved from the Dutch Mobility Panel (MPN) and allowed to be compared with data from the MPN (corrected for (highly) urban areas).

The statements were:

1. The car gives me a feeling of freedom
2. I only use the car when it is really necessary
3. I would only relocate to a house where I can park my car directly next to/in front of my house.
4. I like living in a neighbourhood with few cars on the street
5. Having much green in my neighbourhood is important to me
6. I like having a diverse range of amenities in my neighbourhood, such as shops, schools and restaurants.
7. I would consider relocating if my street were made greener, and if this would result in walking a few minutes to my car.

Figure 6.11 shows that most respondents have similar preferences, except for statement 3, which is about relocating to a house where the car cannot be parked directly next to. Note also that respondents who strongly agreed with either statement 3 or 7 were excluded. This explains why the table shows 0% for strongly agree with those statements. Especially green in the neighbourhood receives a lot of support. Here, most respondents stated 'strongly agree'. Only 1 respondent did not agree with this statement.

A comparison with the MPN-data regarding the first two statements shows that in both the sample and in general many people experience freedom due to the car. Nonetheless, the rate of persons who only uses the car if it is really necessary, according to themselves, is much larger in the sample than in the MPN-data, even when taking into account that the



	Sample	MPN	Sample	MPN	Sample	Sample	Sample	Sample	Sample
	1		2		3	4	5	6	7
No opinion	0.0%	7.2%	0.0%	9.9%	0.0%	1.0%	0.0%	0.5%	0.0%
Strongly disagree	7.6%	1.6%	2.8%	3.9%	13.7%	1.9%	0.0%	0.5%	33.2%
Disagree	4.3%	2.7%	9.0%	18.6%	27.0%	7.6%	0.5%	7.1%	40.3%
Neither agree/disagree	16.1%	10.1%	20.9%	22.3%	28.4%	28.9%	5.7%	23.2%	19.0%
Agree	41.2%	51.4%	46.0%	30.0%	30.8%	39.8%	35.1%	44.6%	7.6%
Strongly agree	30.8%	27.0%	21.3%	15.3%	0.0%	20.9%	58.8%	24.2%	0.0%

Strongly agree · Agree · Neither agree/disagree · Disagree · Strongly disagree · No opinion

Figure 6.11, Agreement with statements percentage of persons who did not have an opinion is much smaller in the sample. A reason for this could be that respondents are indeed more aware of their mode choice, and tend less to the car. However, another explanation is that respondents chose to agree, because they wanted it to be, either because of their attitudes, or because the researcher 'preferred' this. A mix of these reasons, and possibly other reasons as well, is most likely.

6.1.11 Choices experiment

In every choice set, respondents had to choose which neighbourhood they preferred and whether they would want to live in that neighbourhood. Whether persons were willing to live in the preferred neighbourhood is used as input for the model estimation. Table 6.5 gives the percentages of persons who preferred either alternative 1 or 2 and were willing to live in the neighbourhood of their preference. It also reveals that in 21.2% of the choice sets, the respondent did not want to live in the preferred neighbourhood (opt-out).

Table 6.5, Percentages per alternative per block

Choice	Percentage
Total	
Alternative 1	38.7%
Alternative 2	40.1%
Opt-out	21.2%
Block 1	
Alternative 1	38.7%
Alternative 2	39.8%
Opt-out	21.5%
Block 2	
Alternative 1	37.3%
Alternative 2	41.5%
Opt-out	21.2%
Block 3	
Alternative 1	40.1%
Alternative 2	38.8%
Opt-out	21.1%

6.2 Model estimation

Multiple models were estimated, as described in section 2.3.3. First, an MNL-model without interactions was estimated, as well as several MNL-models with interactions with a group of characteristics (socio-demographics, attitudes, transport preferences and the preferred location of a neighbourhood) to reveal which group of characteristics was best able to explain heterogeneity amongst the respondents. To estimate the models, all preferences were used, also those where the respondent did not want to live in the preferred neighbourhood. The MNL-model which included socio-demographics was best able to explain the choice-data (smallest loglikelihood and largest adjusted rho squared), therefore socio-demographic interactions are also used in the ML-model. This model adds a constant C with a mean and standard deviation. The mean of this constant allows distinguishing between persons who wanted to live in their preferred neighbourhood and those who did not. Next, it allows accounting for unobserved heterogeneity, by the standard deviation. The ML-model uses a different dataset than the MNL-models; the dataset for the ML-model uses all choice sets as well, but if someone did not want to live in his preferred neighbourhood, this was regarded as an 'opt-out'. The used systematic utility function is given below:

$$
\begin{aligned}
V_i = C &+ (\beta_{AC_0} + \beta_{I,CA-CB12,0} + \beta_{I,CA-CO,0}) * CA_{i,0} \\
&+ (\beta_{AC_1} + \beta_{I,CA-CB12,1} + \beta_{I,CA-CO,1}) * CA_{i,1} \\
&+ (\beta_{WTtP_0} + \beta_{I,WTtP-CB12_0} + \beta_{I,WTtP-CO_0}) * WTtP_{i,0} \\
&+ (\beta_{WTtP_1} + \beta_{I,WTtP-CB12_1} \\
&+ \beta_{I,WTtP-CO_1}) * WTtP_{i,1} \\
&+ (\beta_{PT_0} + \beta_{I,PT-Yn\ _0} + \beta_{I,PT-Edu_0}) * PT_{i,0} \\
&+ (\beta_{PT_1} + \beta_{I,PT-Yng_1} + \beta_{I,PT-Edu_1}) * PT_{i,1} \\
&+ \beta_{SV_0} * SV_0 + \beta_{SV_1} * SV_1 \\
&+ \beta_{WTtPTSV_{i,0}} * WTtPTSV_0 + \beta_{WTtPTSV_1} * WTtPTSV_{i,1} \\
&+ \beta_{AM_0} * AM_{i,0} + \beta_{AM_1} * AM_{i,1} \\
&+ \beta_{GR_0} * GR_{i,0} + \beta_{GR_1} * GR_{i,1} \\
&+ (\beta_{AMiPS_0} + \beta_{I,AMiPS-Old_0} + \beta_{I,AMiPS-CB12_0}) * AMiPS_{i,0} \\
&+ (\beta_{AMiPS_1} + \beta_{I,AMiPS-Old_1} + \beta_{I,AMiPS-CB12_1}) \\
&* AMiPS_{i,1} \quad (10)
\end{aligned}
$$

$$i \in alt1, alt2$$

$$V_{opt-out} = 0$$

In this function, the attributes are coded as follows in the utility functions:

1. CA = Car access to streets
2. WTtP = walking time to parking
3. PT = available public transport
4. SV = available shared vehicles
5. WTtPTSV = walking time to public transport and shared vehicles
6. AM = amenities within walking distance
7. GR = type of green
8. AMiPS = amenities in public space

Interactions are coded as follows (xx are codes for the attributes, as mentioned earlier):

- I,xx-CB12: interaction between xx and a household with children below 12 years old.
- I,xx-CO: interaction between xx and a household which owns at least one car.
- I,xx-Yng: interaction between xx and persons younger than 40 years.
- I,xx-Old: interaction between xx and persons of 65 years and older.
- I,xx-Edu: interaction between xx and high educated persons

A 0 or 1 as subscript indicates whether a parameter/variable is related to level 0 or 1.

Because the constant has a mean and standard deviation, multiple draws are required to make a good estimation. Multiple models with a different number of draws were estimated. The model with 500 draws was selected, as the constant as well as the loglikelihood remained stable when further increasing the number of draws. Table 6.6 gives an overview of the statistics of the selected model.

Table 6.6, Statistics of the used ML-model

	Value
Number of parameters	34
Initial loglikelihood	-2087.36
Final loglikelihood	-1677.00
$\bar{\rho}^2$	0.180
AIC	3422.00
BIC	3610.69

Tables 6.7 and 6.8 (next pages) give an overview of the estimated parameters of this model. The parameters in 6.7 are applicable to everyone, but the betas of the interactions

(table 6.8) increase or reduce the utility contribution of attribute levels, depending on characteristics of the choice maker. It is therefore not possible to draw hard conclusions based on the betas from table 6.7 only, unless no interactions apply. Some of the estimated betas are insignificant. However, removing insignificant attributes would seem like that attribute has no influence at all, which is not necessarily the case (Amrheim et al., 2019). Also, insignificant interactions are kept, as the ML-model is not used to determine the best selection of interactions to be included.

Table 6.7, Estimated parameters for the constant, standard deviation of the constant and betas for the attribute levels.

Parameter	Attribute level	Parameter value	s.e.	t-stat
C (mean)		0.63***	0.23	2.67
C (st.dev.)		-1.99***	0.18	-11.16
β_{CA_1}	Access for cars with 30 km/h	0.29	0.19	1.51
β_{CA_2}	Access for cars with 5 km/h	0.21	0.18	1.19
$\beta_{CA_{ref}}$	No access for cars	0	-	-
β_{WTtP_1}	<1 minute walking time to parking	0.33	0.22	1.51
β_{WTtP_2}	4 minutes walking time to parking	0.22	0.20	1.13
$\beta_{WTtP_{ref}}$	8 minutes walking time to parking	0	-	-
β_{PT_1}	Available public transport: Bus	-0.18	0.19	-0.96
β_{PT_2}	Available public transport: Bus and tram	0.03	0.16	0.16
$\beta_{PT_{ref}}$	Available public transport: Bus, tram and train	0	-	-
β_{SV_1}	No available shared vehicles	-0.23**	0.11	-2.02
β_{SV_2}	Available shared vehicles: car	-0.10	0.09	-1.12
$\beta_{SV_{ref}}$	Available shared vehicles: car and electric (transport) bike	0	-	-
$\beta_{WTtPTSV_1}$	<1 minute walking time to public transport and shared vehicles	0.37***	0.09	4.02
$\beta_{WTtPTSV_2}$	4 minute walking time to public transport and shared vehicles	0.33***	0.10	3.15
$\beta_{WTtPTSV_{ref}}$	8 minute walking time to public transport and shared vehicles	0	-	-
β_{AM_1}	Available amenities within 5 minutes walking: supermarket and primary school	-0.41***	0.11	-3.72
β_{AM_2}	Available amenities within 5 minutes walking: supermarket, primary school and (non-) food shops	-0.25***	0.11	-2.35
$\beta_{AM_{ref}}$	Available amenities within 5 minutes walking: supermarket, primary school, (non-) food shops and restaurants	0	-	-
β_{GR_1}	Green in the street and multiple small parks	0.33***	0.09	3.79
β_{GR_2}	Green in the street and one large park	0.39***	0.11	3.66
$\beta_{GR_{ref}}$	Much green in the street but no park	0	-	-
β_{AMiPS_1}	Available amenities in public space: Benches	-0.11	0.12	-0.92
β_{AMiPS_2}	Available amenities in public space: Benches and playgrounds	-0.14	0.12	-1.21
$\beta_{AMiPS_{ref}}$	Available amenities in public space: Benches, playgrounds and outdoor sports facilities	0	-	-

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

Table 6.8, Estimated parameters for the betas of the interactions

Parameter	Attribute level	Parameter value	s.e.	t-stat
$\beta_{I,CA\&HHC\_CB12\ 1}$	Interaction car access with 30 km/h and households with children	-0.23	0.31	-0.75
$\beta_{I,CA\&HHC\ \_CB12_2}$	Interaction car access with 5 km/h and households with children	-0.39	0.30	-1.30
$\beta_{I,CA\&CO\ 1}$	Interaction car access with 30 km/h and car-ownership (≥1 car)	0.41*	0.22	1.82
$\beta_{I,CA\&CO\ 2}$	Interaction car access with 5 km/h and car-ownership (≥1 car)	0.66***	0.21	3.20
$\beta_{I,WTtP\&HHC\_CB12_1}$	Interaction <1 minute walking time to parking and having a child ≤12 years	0.72*	0.37	1.93
$\beta_{I,WTtP\&HHC\_CB12_2}$	Interaction 4 minutes walking time to parking and having a child ≤12 years	0.56*	0.34	1.66
$\beta_{I,WTtP\&CO_1}$	Interaction <1 minute walking time to parking and car-ownership	1.00***	0.25	3.99
$\beta_{I,WTtP\&CO_2}$	Interaction 4 minutes walking time to parking and car-ownership	0.48***	0.23	2.10
$\beta_{I,PT\&Age\_young_1}$	Interaction available public transport (Bus) and age ≤39 years.	-0.17	0.20	-0.84
$\beta_{I,PT\&Age\_young_2}$	Interaction available public transport (Bus and tram) and age ≤39 years.	-0.57***	0.18	-3.11
$\beta_{I,PT\&Edu_1}$	Interaction available public transport (Bus) and education level (high)	-0.35	0.21	-1.63
$\beta_{I,PT\&Edu_2}$	Interaction available public transport (Bus and tram) and education level (high)	-0.41**	0.18	-2.28
$\beta_{I,AMiPS\&Age\_old_1}$	Interaction amenities in public space (Benches) and age (≥65 years)	-0.14	0.23	-0.61
$\beta_{I,AMiPS\&Age\_oldy_2}$	Interaction amenities in public space (Benches and playgrounds) and age (≥65 years)	-0.26	0.22	-1.21
$\beta_{I,AMiPS\&HHC_1}$	Interaction amenities in public space (Benches) and household composition (with children)	-0.67***	0.22	-3.08
$\beta_{I,AMiPS\&HHC_2}$	Interaction amenities in public space (Benches and playgrounds) and household composition (with children)	-0.32	0.21	-1.56

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

6.3 Interpretation of estimated parameters regarding neighbourhood preference

When accounting for the interactions with socio-demographics, the absolute values of taste parameters (betas) differ between 0.06 and 2.06. All betas for an attribute level are relative to the reference. A beta of 1.00 for level B thus indicates that utility would increase by 1.00, if B were applicable, compared to when the reference level was applied. Next to that, large values of betas indicate that a level has much influence on the utility in general, small values that it has a small influence. Especially the walking time to parking has a lot of influence on the utility. Also, the availability of public transport and access for cars have moderate influence, closely followed by available amenities in public space. The attribute which has the least influence is shared vehicles. It has to be noted that using different attribute levels would change the size of the betas, and possibly the importance of attributes in relation to others. Nonetheless, attribute levels have been chosen such that they are realistic and represent real neighbourhoods (see section 5.1.1).

The following paragraphs elaborate on the estimated parameters regarding the attribute levels, with interactions being applied. This allows distinguishing between different types of households.

6.3.1 Car-related parameters

Two car-related attributes were included in the experiment, the access for cars to the street, and the walking time to parking. Fort both, interactions were estimated with having children below the age of 12 and with having a car. This allows to create four different household types. Table 6.9 gives the taste parameters for these households. All households prefer having access by car to the street, even households who do not own a car. This was already stated by Stubbs (2002), and thus still applies, even though people nowadays are more open to sustainable transport (Selzer and Langendorf, 2019; Ellder et al., 2022, Kirschner and Langendorf, 2020). Preferences regarding the speed differ, although it is remarkable that households without a car prefer a higher speed than those who do own a car. Access in general is thus more important than speed. The preferences of households with young children seem not logical, because a high speed or no access is preferred over access with a low speed. This could be because of experiences. Streets where cars have to drive with a low speed are usually designed as shared space, which could feel more chaotic than normal streets where a speed of 30 km/h is preferred, because the latter shows clearly which part is meant for whom. However, this is an assumption and might not be the real reason.

When it comes to parking, all households prefer a very short walking time to the car. This is in line with Kirschner and Langendorf (2020) and De Nies (2020). Households with children below the age of 12 have a much stronger preference for a short walking time than households without children. A cause for this could be that parents prefer not to walk lang distances with their children. This also explains why the interaction with children below the age of 12 was significantly different from zero, whereas a general interaction between having children and the walking time to parking was not significant. For older children, walking slightly further is less of a problem. The difference between <1 and 4 minutes walking is smaller than the difference between 4 and 8 minutes, which indicates that the walking time does not linearly influence the utility.

Table 6.9, Betas for car-related attributes for different households

	No children <12, no car	With children <12, no car	No children <12, with car	With children <12, with car
Access for cars with 30 km/h	0.29	0.06	0.70	0.46
Access for cars with 5 km/h	0.21	-0.18	0.88	0.49
No access for cars (reference)	0	0	0	0
<1 min walking to parking	0.33	1.05	1.34	2.06
4 min walking to parking	0.22	0.79	0.71	1.27
8 min walking to parking (reference)	0	0	0	0

Table 6.10, Betas for public transport for different households

	<40, low/middle educated	<40, high educated	≥40, low/middle educated	≥40, high educated
Bus	-0.36	-0.70	-0.18	-0.53
Bus and tram	-0.54	-0.96	0.03	-0.39
Bus, tram and train (reference)	0	0	0	0

The betas for walking time to parking are larger than those for car access to the street, and thus, the walking time has more influence on the choices respondents made. This indicates that it is more important to be able to park close to home than to be able to drive through the street in front of one's house.

Respondents were able to give remarks at the end of the survey. Multiple respondents stated that they wanted their house to be accessible by car to make it easier accessible for visitors, or because residents travel to locations which are poor accessible by public transport.

6.3.2 Public transport and shared vehicles

In general, having multiple forms of public transport including a train is preferred over a public transport offer without a train. For most households, a tram does not replace a train, which can be deduced from the parameters for the bus + tram which strongly differ from bus+tram+train. This could be because trains are more suitable for longer travel distances. Young persons, below 40 years, even value having only a bus over the combination of a bus and tram. It is unclear why they prefer a bus over a tram. A possible explanation is that young respondents do not use a tram often, because it is only available in a few cities. As a result of this, they do not have an opinion regarding the tram. Low-educated persons value a tram and train equally (the beta of -0.06 is insignificant with a t-value of -0.35). This is in line with Kroesen and Van Wee (2021), who show that middle-educated people cover a longer distance by bus, tram and metro than high educated persons. Low educated persons have similar behaviour as high educated persons. However, when looking at income, both low and middle incomes make more use of bus, tram and metro. Based on this, it is likely that they value a train relatively lower, because bus, tram and metro are also important to them.

Table 6.11, Betas for shared vehicles for households with and without a car

	Beta
No shared vehicles	-0.23**
Shared car	-0.10
Shared car and electric (transport) bike (reference)	0

The estimated parameters regarding shared vehicles reveal that people have a small preference for neighbourhoods where shared vehicles are provided. Whether this is only a car, or also an electric (transport) bike makes little difference. Multiple explanations can explain the low value of the betas for shared vehicles. First, the descriptive statistics have shown that only a few respondents make use of shared vehicles, thus many did not experience whether they like it or not. Next to that, persons without a car might not need a shared car, because they know how to live without a personal car. This explanation is in line with findings of Baehler and Rérat (2020) and Selzer (2021). Households who do own a car might not want to use the shared car, because they have their own car.

The last aspect of public transport and shared vehicles in the choice experiment was the walking distance to them. No interactions with this attribute were included in the final model. A low walking time was preferred. Whether this is 4 minutes (0.33) or even less (0.37) makes little difference.

6.3.3 Amenities and public space

Amenities have some influence on the utility of a neighbourhood. Remarkably, both levels have a negative beta, which indicates that respondents prefer to have many different amenities close to their homes, including restaurants. However, also Moreno (2021) presents the importance of having amenities in the vicinity, instead of in city centres only, to create neighbourhoods of high quality. Nonetheless, it is surprising that restaurants are relatively important; the difference between 'supermarket and primary school' and 'supermarket, primary school and (non) food shops' is smaller than the difference between the latter and 'supermarket, primary school, (non) food shops and restaurants.

Green has a similar effect on the utility of a neighbourhood in terms of magnitude: it has some effect, but not as much as car-related betas and available public transport services. This is in line with Kirschner and Langendorf (2020) and Gundlach et al. (2018), if green were regarded as a recreational area, which is one of the purposes of a park. It should be noted that all neighbourhoods contained green, thus respondents did not make a choice between having green or something else. In line with the expectation, neighbourhoods which feature a park are preferred. This could be because parks are more likely to feature attributes which make them more attractive (Giles-Corti et al., 2005; McCormack et al., 2010). Even though the last attribute captures some amenities which can be present in parks, parks are suitable for many more activities. This applies especially to large parks. Parks are not only valued because of possible attributes for the residents themselves, but also because of pets. For example, one respondent commented that a park was mandatory because this respondent has a dog.

The last attribute was about attributes in public space. To persons below the age of 65 and without children, this attribute is very small. Estimated betas are insignificant, but even when accounting for this, they remain very small. However, households with children value the presence of playgrounds and especially outdoor sports facilities. This is no surprise, since these amenities provide an activity, they stimulate playing outside.

It does not matter what age children have. The outcomes of the interaction between amenities in public space and elderly were surprising. It was expected that they would prefer the availability of benches, such that they could sit down easily at multiple spots in the neighbourhood. However, this group has the strongest preference for a neighbourhood with outdoor sports facilities, followed by a neighbourhood with benches only. This interaction is insignificant and it is unlikely that these elderly want to have sports facilities for themselves, although it cannot be ruled out. It is more likely that they associate a neighbourhood with outdoor sports facilities with a neighbourhood they like, for example, because these facilities require space, and make the neighbourhood more spacious.

Table 6.12, Betas for amenities in public space for households without and with children below 12 years

	<65 years Without children	<65 years With children	≥65 years
Benches	-0.11	-0.78	-0.25
Benches and playgrounds	-0.14	-0.47	-0.40
Benches, playgrounds and outdoor sports facilities (reference)	0	0	0

6.3.4 Constant

A constant with a mean and standard deviation was estimated, resulting in a mean of 0.63 and a standard deviation of -1.99. The mean indicates a small preference for moving to a car-reduced neighbourhood over not being willing to move to such a neighbourhood. The standard deviation is large when compared with the betas, which means that a lot of heterogeneity exists which could not be explained by the betas. This is in line with the quite low adjusted rho squared.

6.4 Profiles

The interactions with socio-demographics allow revealing the preferences of many different household types. The previous sections revealed the differences per attribute. Appendix G gives a complete overview of the household types, which can be composed using the interactions. Only households with elderly as main residents and (young) children are not included, since these households will be scarce. This results in 24 household types which differ in:

- Age of the main residents (parents in case of a household with children): <40; 40-64 and ≥65 years.
- Presence of children
- Presence of children <12 years
- Car-ownership (with/without a car)

6.5 Effects on car-ownership

If respondents stated to be willing to live in a neighbourhood, and if they owned at least one car, they were asked what the likelihood was that they would relinquish their car (or one of their cars in case they owned multiple cars). Respondents could indicate this on a 5-point scale from highly unlikely to highly likely.

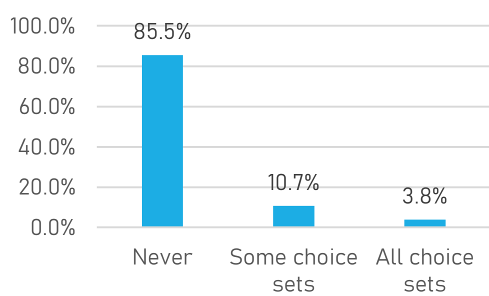


Figure 6.12, Likelihood that a respondent will relinquish his car in a choice-set

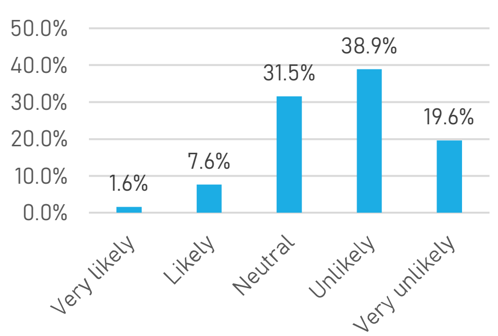


Figure 6.13, Percentages of respondents which is likely to relinquish their car in any, some or all choice-sets

Answers are used to determine whether a relation exists between the willingness of respondents to relinquish their car, and the characteristics of a neighbourhood. In general, respondents were willing to relinquish their car in 10% of the chosen neighbourhoods (see figure 6.12). However, some respondents are willing to do so in all their choices, others in some and many respondents never want to relinquish their car. Figure 6.13 shows that most respondents never want to relinquish their car. Almost 4% always states that it is likely that they would relinquish their car, thus it does not depend on characteristics of the preferred neighbourhood. Almost 11% sometimes state that it is likely that they would relinquish their car. This group is interesting, because the characteristics of a neighbourhood matter.

The following sections elaborate on the effects of different aspects on car-ownership. Section 6.4.1 uses an ML-model to estimate the effects of different attributes of a neighbourhood on the likelihood to relinquish a car. Sections 6.4.2 and 6.4.3 estimate the correlation between respectively socio-demographics and attitudes and the likelihood to relinquish the car. Knowledge regarding socio-demographics is valuable, because it can be used in practice as residential developments are intended for one or more socio-demographic groups. Attitudes are of smaller practical use, because neighbourhoods are generally not developed for groups with similar attitudes. Nonetheless, attitudes are expected to have a stronger correlation with the likelihood to relinquish the car.

6.5.1 Influence of neighbourhood attributes

To estimate the effects of attributes of neighbourhoods, a similar method as for the willingness to live has been used. However, in this case, the 'opt-out' does not consist of persons who do not want to live in the neighbourhood of their preference, but of persons who stated it to be (very) unlikely or neither likely/unlikely to relinquish their car.

Again, multiple models with a different number of draws were selected, to discover which minimum number of draws was required to gain stable parameters. The model with 2000 draws was selected. The estimates of this model are presented in table 6.13. The statistics of this model are presented in table 6.14 (next page). Note that only few attributes have significant betas. Some betas are very large and strongly insignificant. This is most likely caused by the small number of persons who were likely to relinquish their car, as this was the case in only 9% of the choice sets (108 choice sets). The constant for preferred neighbourhoods, where respondents were likely to relinquish their car, is -6.09, which already indicates a low probability that

Table 6.13, Betas for attribute levels when considering the choice between a neighbourhood and relinquishing the car, or not moving to a neighbourhood (Section 6.4.1). In blue are the levels which contribute most to relinquishing the car.

Parameter	Attribute level	Parameter value	s.e.	t-stat
C (mean)		-6.09	193.63	-0.03
C (st.dev.)		7.31***	1.59	4.60
β_{CA_1}	Access for cars with 30 km/h	-5.15	193.62	-0.03
β_{CA_2}	Access for cars with 5 km/h	0.21	0.34	0.62
$\beta_{CA_{ref}}$	No access for cars	0	-	-
β_{WTtP_1}	<1 minute walking time to parking	0.40	0.44	0.91
β_{WTtP_2}	4 minutes walking time to parking	0.24	0.38	0.63
$\beta_{WTtP_{ref}}$	8 minutes walking time to parking	0	-	-
β_{PT_1}	Available public transport: Bus	-5.56	193.62	-0.03
β_{PT_2}	Available public transport: Bus and tram	-0.91***	0.33	-2.74
$\beta_{PT_{ref}}$	Available public transport: Bus, tram and train	0	-	-
β_{SV_1}	No available shared vehicles	-4.59	193.62	-0.02
β_{SV_2}	Available shared vehicles: car	0.28	0.33	0.84
$\beta_{SV_{ref}}$	Available shared vehicles: car and electric (transport) bike	0	-	-
$\beta_{WTtPTSV_1}$	<1 minute walking time to public transport and shared vehicles	0.93***	0.36	2.60
$\beta_{WTtPTSV_2}$	4 minute walking time to public transport and shared vehicles	-0.36	0.45	-0.80
$\beta_{WTtPTSV_{ref}}$	8 minute walking time to public transport and shared vehicles	0	-	-
β_{AM_1}	Available amenities within 5 minutes walking: supermarket and primary school	-0.26	0.44	-0.60
β_{AM_2}	Available amenities within 5 minutes walking: supermarket, primary school and (non-) food shops	-0.03	0.43	-0.06
$\beta_{AM_{ref}}$	Available amenities within 5 minutes walking: supermarket, primary school, (non-) food shops and restaurants	0	-	-
β_{GR_1}	Green in the street and multiple small parks	0.69**	0.34	2.01
β_{GR_2}	Green in the street and one large park	0.47	0.43	1.11
$\beta_{GR_{ref}}$	Much green in the street but no park	0	-	-
β_{AMiPS_1}	Available amenities in public space: Benches	-5.53	193.62	-0.03
β_{AMiPS_2}	Available amenities in public space: Benches and playgrounds	-0.47	0.35	-1.35
$\beta_{AMiPS_{ref}}$	Available amenities in public space: Benches, playgrounds and outdoor sports facilities	0	-	-

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

Table 6.14, Statistics of the ML-model including the likelihood to relinquish a car

	Value
Number of parameters	18
Initial loglikelihood	-1255.71
Final loglikelihood	-212.10
$\bar{\rho}^2$	0.817
AIC	460.21
BIC	550.95

someone chooses a neighbourhood in combination with relinquishing his car. Nonetheless, the standard deviation of 7.31 indicates a lot of unexplained variance. The estimated parameters reveal that some attribute levels have a very large influence on the likelihood of relinquishing the car. If they are present, they strongly decrease utility and thereby the likelihood of relinquishing a car. These have very large, but insignificant betas.

These are the following attribute levels:

- Access for cars with 30 km/h (β=-5.15)
- Public transport which comes in the form of only a bus (β=-5.56)
- A lack of shared cars (β=-4.59)
- Having only benches in the neighbourhood and no playgrounds or outdoor sports facilities (β=-5.53)

The first beta reveals that if cars have access with 30 km/h, the likelihood of relinquishing a car drops strongly. This is likely because a neighbourhood where cars have access with 30 km/h could still feel quite car-oriented, which makes it less attractive for persons who want to live without a car. Nonetheless, persons still prefer neighbourhoods where cars have access, but just with a low speed. This could be to remain having access to one's home if someone uses a car, even though it is not a private car. A broad range of public transport, preferably a bus, tram and train, and shared vehicles are key when someone relinquishes his car. This is logical, since one does not stop travelling, and thus needs an alternative. The fourth element having a strong influence is remarkable because it is not related to transport. Nonetheless, section 6.3.3 has shown that this element can have a strong influence on the willingness of persons to choose a neighbourhood, and the estimated model including the likelihood to relinquish the car is not only about relinquishing the car, but about what neighbourhoods persons prefer if they relinquish their car. This also explains the betas for green, which certainly have some effect. These show again a preference for neighbourhoods which feature a park.

For every attribute, the level which contributes most to the utility of a neighbourhood is marked blue. A neighbourhood with these attribute levels would have the largest utility, and thereby the largest positive effect on a decrease in car-ownership.

No interactions were included in this model, as these did not result in reliable models. However, the following paragraphs estimate the correlation between the likelihood to relinquish the car and socio-demographics/attitudes.

6.5.2 Influence of socio-demographics

Correlations with four socio-demographics (age, household composition, education level and income) have been estimated to reveal whether a relation exists between socio-demographics and the likelihood to relinquish a car. In previous chapters, the socio-demographic car-ownership was used as well, but persons without a car cannot relinquish their car and are therefore not included here. Correlations with socio-demographics appear to be very small (see table 6.15), thus the effect of socio-demographics on the likelihood to relinquish the car is marginal, according to this study (vice versa is not logical, since car-ownership does not influence someone's age, number of children etc.).

Table 6.15, Correlations between socio-demographics and the likelihood to relinquish the car

	Spearman's correlation
Age	0.068**
Children	0.029
Education level	0.020
Income	0.093***

*** = significantly different from 0 at 99% (p-value < 0.01)
** = significantly different from 0 at 95% (p-value < 0.05)
* = significantly different from 0 at 90% (p-value < 0.1)

The correlation with age reveals that the older someone gets, the more likely he is to relinquish their car. Households with children seem to be slightly more likely to relinquish their car, but this cannot be explained. Persons with a higher education level and/or a higher income are also more likely to relinquish their car (these two socio-demographics are correlated (0.423, 99% significant), even though income level is significant and education level is not).

6.5.3 Influence of attitudes

Almost all attitudes have a significant correlation with the likelihood to relinquish the car (see table 6.16). The only exception is the correlation with statement 5, but none of the respondents disagreed with this statement and only 6% was neutral. This could explain the very low value and the insignificance, as differences amongst respondents are small. Five of the seven (1-4 and 7) statements were related to the importance of the car to a respondent. These have the largest correlations with the likelihood to relinquish the car. They reveal that the more car-minded a person is, the less likely it is that he would relinquish his car. Car-minded persons are those who experience (a lot of) freedom by the car, who also use their car when it is not necessary and want to park their car close to their house. Lastly, they do not mind having cars parked at the street.

Statement 6 is significant as well, but much smaller than those statements related to the car. This correlation reveals that persons who prefer to live in a neighbourhood with many amenities are more likely to relinquish their car. This is no surprise, since locations with many amenities reduce the need for a car (Ellder et al., 2022), and are also usually well connected to the public transport network. Especially the city centres feature many amenities. The correlation between statement 6 and the preferred location to live (-0.250, 99% significant) reveals that persons who prefer to have many amenities in their neighbourhood, prefer to live closer to the city centre.

The other direction of the causality, the likelihood to relinquish a car which explains agreement with a statement, is less likely. Relinquishing a car can influence attitudes, someone who wants to relinquish his car could attach less value to being able to park his car in his street, but it is expected that the act of relinquishing a car is still caused by other motivations, which can be attitudes, but also financial reasons. This however goes beyond the topic of this study.

Table 6.16, Correlations between attitudes and the likelihood to relinquish a car

Statement		Spearman's correlation
1	*The car gives me a feeling of freedom.*	-0.398***
2	*I only use the car when it is really necessary.*	0.318***
3	*I would only relocate to a house where I can park my car directly next to/in front of my house.*	-0.205***
4	*I like living in a neighbourhood with few cars on the street.*	-0.267***
5	*Having a lot of green in my neighbourhood is important to me.*	-0.021
6	*I like having a diverse range of amenities in my neighbourhood, such as shops, schools and restaurants.*	0.055*
7	*I would consider relocating if my street were made greener, and if this would result in walking a few minutes to my car.*	-0.109***
	*** = significantly different from 0 at 99% (p-value < 0.01) ** = significantly different from 0 at 95% (p-value < 0.05) * = significantly different from 0 at 90% (p-value < 0.1)	

6.5.4 Influence of transport mode preferences

The preferred transport mode is likely to affect the likelihood to relinquish a car; persons who like to travel by car are less likely to relinquish it than those who prefer to travel by another mode. This is reflected in the estimated correlations. If someone prefers to travel by car, the likelihood of relinquishing a car reduces. This applies especially to those who prefer to travel by car to the supermarket (table 6.17). However, only few percent of the respondents of the survey preferred to travel by car to work, much less than in the Netherlands Mobility Panel, thus this correlation might be different.

Table 6.17, Correlation between a preference to use the car and the residential location, and the likelihood to relinquish the car

	Spearman's correlation
Preference to travel by car	
To work	-0.046
To supermarket	-0.186***
Residential location	-0.207***

*** = significantly different from 0 at 99% (p-value < 0.01)
** = significantly different from 0 at 95% (p-value < 0.05)
* = significantly different from 0 at 90% (p-value < 0.10)

6.5.5 Influence of residential location preference

The last correlation is the correlation between the likelihood to relinquish a car and the preferred location of the residence. The location ranged from a highly urban to a rural area:

1) Centre of a city
2) Neighbourhood adjacent to the centre of a city
3) Other neighbourhoods in a city
4) Village in an urban region
5) Village in a rural region

The negative correlation of -0.207 (99% significantly different from 0) reveals that some correlation exists between the likelihood to relinquish the car and the preferred location to live. Persons who prefer to live in a more urban area are more likely to relinquish their car. This can be explained, as these areas usually provide more functions, such as offices and amenities, as well as more public transport, and thereby better connections with destinations further away, than more rural areas. The causation also works in the other direction. Persons who are likely to relinquish their car prefer a location with many amenities as well as good public transport. This reveals that car-reduced neighbourhoods in a highly urban area are more likely to contribute to a reduction in cars, as persons who settle in them are more likely to relinquish their car.

6.6 Conclusion

This chapter gave an overview of the results of the discrete choice experiment. respondents represented all different socio-demographic groups, although some groups were over and others underrepresented. The estimated ML-model revealed that especially cars play an important role when choosing a neighbourhood, but public transport and amenities in public space as well. Shared vehicles, green and amenities play a smaller role. Nonetheless, preferences differ per household type. By the constant, the model revealed that a lot of unexplained heterogeneity exists amongst respondents. When it comes to relinquishing cars is it mandatory that alternatives are present. These include multiple forms of public transport and shared cars.

7. Application

The previous chapter gave an overview of the importance of attributes of a neighbourhood, when choosing a neighbourhood. Estimated parameters were retrieved from choices for conceptual neighbourhoods. This chapter applies the estimated parameters to real neighbourhoods to reveal which are more or less popular.

7.1 Comparison of neighbourhoods

Chosen neighbourhoods are relatively new, or being realised at the moment, as they are assumed to be similar to neighbourhoods being developed in the near future. Ten neighbourhoods were selected. The selected neighbourhoods are given in table 7.1. Comparing these reveals which neighbourhoods would be more successful, if the choice for a neighbourhood were only based on the attributes as used in this study. In reality, neighbourhoods have many more characteristics, which can attract or repel potential inhabitants. This should be kept in mind when reading this chapter.

Table 7.1, Overview of selected neighbourhoods

Neighbourhood	City
Car-reduced	
Merwedekanaalzone	Utrecht
Sluisbuurt	Amsterdam
Schieoevers-North	Delft
Merwe-Vierhavens	Rotterdam
GWL-terrain	Amsterdam
Car-included	
Nesselande	Rotterdam
Leidsche Rijn	Utrecht
IJburg	Amsterdam
Look-West	Den Hoorn
Ypenburg	Den Haag

The utility of these neighbourhoods is estimated for all possible profiles in this study. This requires to express the characteristics of these neighbourhoods in the available attribute levels. Tables 7.2 and 7.3 give the chosen attribute levels for all neighbourhoods. Appendix I gives further details about these neighbourhoods, and elaborates on the choices made for the selected attribute levels.

Table 7.2, Selected attributes for car-reduced neighbourhoods

Attribute	Merwede-kanaalzone	Sluisbuurt	Schieoevers-North	Merwe-Vierhavens	GWL-terrain
Access for cars	No access	Access with 30 km/h	Access with 5 km/h	Access with 30 km/h	No access
Walking distance to parking from home	4 minutes	4 minutes	4 minutes	4 minutes	4 minutes
Available transport services	Bus	Bus and tram	Bus, tram and train	Bus and tram	Bus and tram
Available shared mobility	Shared car and electric (transport) bike	Shared cars	Shared cars	Shared car and electric (transport) bike	Shared cars
Walking distance to transport services	4 minutes	8 minutes	8 minutes	8 minutes	4 minutes
Amenities within 5 minutes (400m) walking	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants
Green in the neighbourhood	Green in the street and one large park	Green in the street and multiple small parks	Green in the street and multiple small parks.	Green in the street and multiple small parks	Much green in the street, but no park.
Amenities in public space	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches	Benches, playgrounds and outdoor sports facilities	Benches and playgrounds

Table 7.3, Selected attributes for car-included neighbourhoods

Attribute	Nesselande	Leidsche Rijn	IJburg	Look-West	Ypenburg
Access for cars	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h
Walking distance to parking from home	<1 minute	<1 minute	<1 minute	<1 minute	<1 minute
Available transport services	Bus and tram	Bus	Bus and tram	Bus	Bus and tram
Available shared mobility	Not available	Shared cars.	Shared cars	Not available	Shared cars
Walking distance to transport services	8 minutes	8 minutes	4 minutes	8 minutes	4 minutes
Amenities within 5 minutes (400m) walking	Supermarket and primary school.	Supermarket and primary school	Supermarket, primary school, (non) food shops and restaurants	Supermarket and primary school	Supermarket and primary school
Green in the neighbourhood	Green in the street and one large park	Green in the street and multiple small parks.	Green in the street and multiple small parks	Green in the street and multiple small parks	Green in the street and multiple small parks
Amenities in public space	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and sport facilities	Benches, playgrounds and outdoor sports facilities

Multiple simulations with a different number of draws have been performed. The number of draws has been increased until the results were stable, which was at 500 draws. The simulation reveals the percentage of households which would prefer to live in every neighbourhood over the other selected neighbourhoods. Next to the option of living in one of the neighbourhood, they can also not move. Including other neighbourhoods would thus give different results. Nonetheless, a neighbourhood which emerges as a popular neighbourhood is likely to remain popular. One has to keep in mind that, to estimate the preference for these neighbourhoods, attributes of those had to be expressed in the attribute levels used in this study. However, differences exist between reality and the chosen attributes, because only three levels exist per attribute. One should therefore not draw hard conclusions from this comparison, as it is only intended to give an impression. Appendix I gives the chosen attribute levels per neighbourhood, as well as a brief explanation behind the choice for a certain level.

The comparison of the neighbourhoods (table 7.4, see appendix J for a comparison per household type) reveals that most neighbourhoods attract a similar share of households, although there are some outliers. IJburg attracts much more households, about twice as much as most other neighbourhoods, whereas the GWL-terrain only attracts few households.

Table 7.4, Average percentage of households that prefers to live in each neighbourhood (average over all percentages per household type per neighbourhood)

Neighbourhood	Percentage
Car-reduced	
Merwedekanaalzone	9.3%
Sluisbuurt	8.4%
Schieoevers-North	8.3%
Merwe-Vierhavens	9.3%
GWL-terrain	4.0%
Car-included	
Nesselande	8.5%
Leidsche Rijn	8.5%
IJburg	17.8%
Look-West	7.5%
Ypenburg	11.8%
Not willing to move	6.7%

In general, car-included neighbourhoods seem to be preferred over car-included neighbourhoods. However, based on this comparison, one cannot draw hard conclusions, such as a percentage of households which would be willing to move to a car-reduced neighbourhood. This is because these ten neighbourhoods do not represent car-reduced nor car-included neighbourhoods. Households without a car prefer a car-reduced neighbourhood more often, compared to households who own a car.

7.2 Elaboration on popularity of neighbourhoods

The cause for the popularity of IJburg is primarily its good accessibility by both car, public transport and shared vehicles. Cars have access and can be parked close to one's house, whereas the walking distance to public transport is also short with about 4 minutes. This is a short walking time, also compared with car-reduced neighbourhoods. The form of public transportation, a bus and a tram, primarily attracts persons older than 40 – persons below 40 prefer neighbourhoods with, if no train is available, only a bus. This explains the difference in the probabilities between persons younger and older than 40. This taste difference between households in which persons are older or younger than 40 also applies to the other neighbourhoods (Leidsche Rijn and Nesselande reveal this difference clearly, as the only difference between these neighbourhoods is the availability of a tram (metro) in Nesselande). Another aspect which makes IJburg attractive is the availability of many amenities at walking distance. It is the only neighbourhood where cars have full access, but different amenities are nearby as well. The neighbourhood which scores second regarding popularity, Ypenburg, has many similarities with IJburg. The only difference is the availability of amenities. Ypenburg has, similar to the other VINEX-neighbourhoods Nesselande and Leidsche Rijn, a single centre with amenities, whereas amenities in IJburg are more distributed over the neighbourhood.

The car-reduced neighbourhoods reveal more differences between preferences of household types. The average popularities are similar, except for the GWL-terrain which scores much lower. The Merwedekanaalzone and Merwe-Vierhavens are the most popular car-reduced neighbourhoods. However, the popularity of the Merwedekanaalzone deviates between 5.4% and 15.5%, whereas Merwe-Vierhavens is more steady with percentages between 7.0 and 12.1. Households with children, young parents and without a car have the largest preference for the Merwedekanaalzone. In case of older parents, above 40 but still below 65, the Merwedekanaalzone remains preferred, but to a lower extent than for younger parents. However, Merwe-Vierhavens is more often preferred amongst this group of older parents. This difference is again caused by the tram. The car-reduced neighbourhood which is able to attract most households of a single type is Schieoevers-North, which primarily attracts households without children. Especially young high-educated households prefer this neighbourhood. The main cause for this is the availability of a train, which is only available in this neighbourhood. Another remarkable aspect of Schieoevers-North is its capability to attract households with a car. It does not attract as many households with a car as popular car-included neighbourhoods, but of the car-reduced neighbourhoods, it attracts most. An explanation for this is that cars still have access to the neighbourhood, although with a low speed. Besides, the neighbourhood is also good accessible by public transport. As a result of this, Schieoevers-North could be the type of car-reduced neighbourhoods which could contribute most to a reduction in car-ownership, from this selection of car-reduced neighbourhoods which are described according to the attribute levels of this study. Schieoevers-North could even become much more attractive when more amenities in public space were present. In this application, the most restrained level has been chosen, as plans of this neighbourhood are unclear regarding available possibilities to sport and play. The addition of playgrounds and/or sport facilities would make the neighbourhood also attractive amongst households with children. On average, 12.5% of the households would prefer Schieoevers-North when adding playgrounds and outdoor sports facilities, compared to 8.3% without them. IJburg and Ypenburg drop in this case with respectively 1.0 and 0.7%.

The least preferred neighbourhood is the GWL-terrain. This is not caused by a single attribute, but by multiple. It is not accessible by car, and no sport facilities are available. A park is available neither, but the GWL-terrain could also be experienced as a large park with residences, due to the enormous amount of green. Available public transport, a bus and a tram, also decreases the utility, but this is common, as only Schieoevers-North features a train which does not decrease utility. This does not mean that a neighbourhood like the GWL-terrain cannot be a success, but it might not be a success for the general public, but just for certain groups. Next to that, it should, again, be noted that here, only ten neighbourhoods are compared, based on only eight attributes, thus including other attributes, and account for other characteristics of choice-makers might give different results.

7.3 Potential improvements of car-reduced neighbourhoods

The previous paragraphs have shown that car-reduced neighbourhoods can attract people, but how could they attract more people? In general, reducing the walking time to parking would increase their popularity, but reducing this walking time would also reduce the car-reduced identity of these neighbourhoods. The same applies to providing access for cars, which could make car-free neighbourhoods more attractive, but also get rid of their car-free identity. Nonetheless, even providing some access with low speeds already improves their utility, since access is valued higher than speed. Also adding a train would make them more attractive, but since these neighbourhoods, except for Schieoevers-North, are not developed next to train tracks, adding a station within walking distance will be hard, and unrealistic. However, the Merwedekanaalzone is located at around 2 kilometres cycling from two stations of Utrecht, thus a station is still close, only not according to the attributes as in this study. For attributes other than the car and public transport, the Merwedekanaalzone already has a good score. The Sluisbuurt provides access for cars to the neighbourhood. This neighbourhood could primarily improve by reducing the walking time to public transport. This also applies to Schieoevers-North and Merwe-Vierhavens, although Schieoevers-North is close to a train station to which in general a longer walking time is accepted than to a bus or tram stop. However, Merwe-Vierhavens is supposed to provide a small autonomous bus to connect the neighbourhood to the tram and metro network and reduce walking times to public transport. However, even though this bus reduces the walking time, it adds an extra transfer to one's trip.

7.4 Conclusion

Accessibility matters. More accessible neighbourhoods are preferred over less accessible neighbourhoods. In general, this application reveals again that attracting persons to car-reduced neighbourhoods is a challenge, due to the focus on cars. Nonetheless, it also reveals that a car-reduced neighbourhood can compete for certain types of households. If these households move to a car-reduced neighbourhood and thereby do not buy a car later on, the neighbourhood still leads to a reduction in cars because less new cars are bought. Nonetheless, the effect would be much larger if car-owners were seduced to reside in a car-reduced neighbourhood and relinquish their car. However, Schieoevers-North has shown that this is possible, even though this neighbourhood is not as preferred as some car-included neighbourhoods for car-owners.

8. Discussion, conclusion and recommendations

8.1 Discussion

This study gave more insight into the importance of different characteristics of car-reduced neighbourhoods to potential residents. In this, it accounted for heterogeneity amongst households. The descriptive statistics showed that many different persons submitted a response. However, even though most socio-demographic groups were included, their distribution differed from reality. Especially high-educated persons and persons between 55 and 64 years were overrepresented. These differences could influence the results, but, where socio-demographic differences were expected, this was accounted for. Next to this, even though the sample is not representative for the population of Dutch cities, it is questionable whether the sample should be representative, because one can ask whether the residents of car-reduced neighbourhoods should be similar to other neighbourhoods of a city when it comes to socio-demographics. Nonetheless, this is not a relevant discussion for this study, as this study does not focus on the market potential of car-reduced neighbourhoods.

Something for which this study did not account are the preferred transport modes of respondents. Compared to the Netherlands Mobility Panel (Hoogendoorn-Lanser and De Haas, 2019), only few respondents prefer to use their car for commuting, doing groceries and other trips. This can be explained by the selection of respondents; those who were too car-minded, and thereby highly unlikely to relocate to a car-reduced neighbourhood, were excluded. Nonetheless, differences remain large. As a result of this, this study might underestimate the importance of cars to people.

The mixed logit model revealed that the car, and especially the walking time from the residence to the car, is very important to respondents, more important than the other attributes, when using the attribute levels as in this study. The only exception are households without a car and without young children. This reveals that the car is embedded in society, and even persons who do not prefer to use it attach much value to accessibility by car, which is in line with Selzer (2021). Public transport is regarded as important, although not as important as access for cars. This is in line with the findings of Baehler and Rérat (2020), who reveal that having a bus or tram stop and local train station at a very short walking distance is very important to residents of car-reduced neighbourhoods. Similarly to this study, Baehler and Rérat (2020) found that a shared car is seen as important for residents of a car-reduced neighbourhood, but not as important as public transport, shops for daily needs and places for recreation, which could be parks and/or playgrounds.

A surprising outcome of this study regarding public transport was the value of a tram: young adults, below the age of 40, prefer having a bus over the combination of a bus and a tram. The combination of a bus and tram was expected to be preferred, since this is likely to connect the neighbourhood with more destinations. Next to that, people generally prefer a tram when choosing between a tram and bus, the so-called rail bonus (Axhausen et al., 2001; Scherer, 2010; Bunschoten et al., 2013). However, Ben-Akiva and Morikawa (2002) did not find this rail bonus in their study. They also stated that if the metro is slow, and the bus is of high quality, people prefer the bus. A possible explanation of the value of a tram for young adults could be their associations with a tram and/or bus. Another surprising finding, which is most likely also caused by associations, is the preference of elderly for neighbourhoods featuring outdoor sports facilities. This is however insignificant, and could be caused by an association with spaciousness if outdoor sports facilities are present.

This study also showed that people prefer to have a broad range of amenities within a small walking time. It was not expected that they would also attach relatively much value to the presence of restaurants, because most people are not expected to visit a restaurant multiple times a week in contrast to other amenities. Baehler and Rérat (2020) reveal that the proximity of shops for daily needs is very important, but that restaurants are only if little importance. This study only included amenities which could be reached within 5 minutes walking. If also cycling would be included, residents would be able to reach many more amenities, and a lower density of amenities could be applied (instead of, for example, many primary schools to make sure that everyone can reach one within 5 minutes walking). Cycling would also allow improving the connection between the neighbourhood and the public transport network. For example, the Merwedekanaalzone and Leidsche Rijn are situated at only few minutes cycling from multiple train stations. As those are too far for walking, the application did not include the train. Their popularity could therefore be underestimated in the application.

The revealed low likelihood of relinquishing a car is in line with literature. Selzer shows that only a few residents relinquished a car, after relocating to a car-reduced neighbourhood. Melia (2014) gives different estimates, between 10% and 62%. Claasen (2020) found a possible reduction of 15% as a result of shared vehicles. Public transport is key when relinquishing a car, which was again revealed in this study, but also by Leibling (2014) and Selzer (2021). To increase the reduction in car-ownership, more measures, which could not be included in the choice-experiment, are required. Gundlach et al. (2018) found for example that the percentage of persons willing to accept car-free policies increases when public transport becomes free of charge.

The application revealed the percentages of people preferring to relocate to each neighbourhood. It is important to keep in mind that not only neighbourhood characteristics influence whether someone will relocate to a neighbourhood or not. Currently, a limited number of houses is available due to the housing crisis, which might cause people to choose a neighbourhood they would not choose if more houses would be available. This does however not influence the outcomes of this study.

8.2 Conclusion

Many cities are planning to reduce the presence and use of cars, because of the negative sides of them. Cars emit air-pollutants and noise, and consume a lot of space, which is also required for other functions such as residences and green spaces. A measure which stimulates the use of sustainable transport and creates a liveable place of residence is the realisation of car-reduced neighbourhoods. Literature and urban plans reveal that these are characterised by:

1) Measures which reduce access for cars
2) The availability of public transport and shared vehicles,
3) Amenities in the neighbourhood itself to stimulate active modes
4) Public space of high quality with much green

This study aimed to reveal the preferences of potential residents of car-reduced neighbourhoods, to be able to create neighbourhoods which attract many residents and thereby reduce car-usage and car-ownership. This was studied using a discrete choice experiment analysed via a mixed logit model.

Even though respondents were less car-oriented than inhabitants of Dutch cities in general, the car remained very important to many of them when choosing their neighbourhood. Only to households without a car and without young children, it had low value. The walking time to the car is most important when choosing a neighbourhood, especially for those households who own a car and(/or) young children. The walking time is even more important than being able to access the street by car, although access, even with low speeds, is still preferred over not having access. Car-free neighbourhoods are therefore expected to attract primarily households without a car, thus these will contribute less to a reduction in car-usage than car-reduced neighbourhoods.

Sustainable mobility in the form of public transport and shared vehicles is not as important as car-related parameters. Most persons prefer neighbourhoods close to a train station, especially young high-educated persons. On the contrary, public transport is only of small importance to older (40+) low and middle-educated persons. Shared vehicles are also of low importance to all personas, but this is likely to be caused amongst others by a lack of experience using shared mobility. All households prefer to live close to public transport and shared mobility, although it makes no difference whether this is 4 minutes walking or less.

Preferences regarding amenities within short walking distance reveal a preference for neighbourhoods featuring a broad range of amenities, which contain, next to a supermarket and primary school, (non) food shops and restaurants. Respondents also showed a preference for neighbourhoods featuring one or more parks. Whether this is a single large park, or several small parks throughout the neighbourhood makes little difference. The second aspect of the quality of public space, amenities in public space, differs in importance between households. To Households without children, it is not important whether amenities are present. However, it is very important for households with children that playgrounds, and preferably also outdoor sports facilities, are present in the neighbourhood.

This study also looked at the relationship between different aspects of potential residents of car-reduced neighbourhoods and those neighbourhoods themselves, and the likelihood to relinquish a car. In general, the percentage of people willing to relinquish their car is low. However, up to 15% of the respondents was likely to relinquish their car in some neighbourhoods. The mixed logit model for the choice for a neighbourhood in combination with relinquishing a car revealed that the availability of high-quality public transport is key, especially a train is important. Also shared vehicles must be present, especially shared cars. Older persons and those with a higher income seem to be slightly more likely to relinquish their car, but correlations between socio-demographics and the likelihood to relinquish a car were low. Correlations with attitudes were stronger. Car-oriented persons were much less likely to relinquish their car than those who own a car but attach little value to it. The same applies to the usage of the car: persons who prefer to use it for regular trips are less likely to relinquish it than those who prefer other modes. Lastly, the correlation between the likelihood of relinquishing a car and the preferred location to live revealed that the higher the rate of urbanity, the larger the likelihood of relinquishing a car. This is promising for car-reduced neighbourhoods, as those are usually highly urban neighbourhoods, thus they are likely to attract those persons who are most likely to relinquish their car.

Results were applied to existing and planned neighbourhoods. This revealed that especially neighbourhoods which are well accessible by car and by public transport are preferred. In general, car-included neighbourhoods remain preferred over car-reduced neighbourhoods. Nonetheless, the latter are able to attract even residents with a car, if they are accessible by train, and if cars remain to have some access. This allows them to compete with car-included neighbourhoods, even though they do not provide parking at such short walking times as car-included neighbourhoods.

8.3 Recommendation

This study aimed to reveal what is required to make car-reduced neighbourhoods attractive for potential residents. The following is recommended when designing a car-reduced neighbourhood:

1) A completely car-free neighbourhood attracts primarily households without a car, who cannot relinquish their car. To use car-reduced neighbourhoods to reduce car-usage and car-ownership, create neighbourhoods where cars have some access. These neighbourhoods can attract car-owning households and thus reduce car-usage and car-ownership.
2) Car-reduced neighbourhoods must be well accessible by high-quality public transport, which can easily be reached. Especially locations close to a train station can attract residents.
3) People prefer neighbourhoods with a park. Households with children especially value neighbourhoods which stimulate activities, which have playgrounds and outdoor sports facilities.

For further research, the following is recommended:

1) Perform a similar study, but amongst a larger sample with people from all socio-demographic classes. This study included people from all socio-

demographic classes, but some classes were strongly underrepresented. A possibility is to do this in cooperation with a municipality, since results are useful for municipalities and municipalities have the possibility to distribute the survey among many households. To do this, the study should be done in cooperation with the municipality, otherwise municipalities tend to be reluctant.

2) Evaluate the opinions of residents of large car-reduced neighbourhoods which are being realised at the moment. This can give even more insight into why they choose to relocate to a car-reduced neighbourhood and what they (do not) value about those neighbourhoods.

References

Amrheim, V., Greenland, S. and McShane, B. (2019). Retire statistical significance. *Nature, 567,* 305-307. https://doi.org/10.1038/d41586-019-00857-9.

Axhausen, K.W., haupt, T., Fell, B. and Heidl, U. (2001). Searching for the Rail Bonus. Results from a panel SP/RP study. *European Journal of Transport and Infrastructure Research, 1 (4),* 353-369. https://doi.org/10.3929/ethz-a-006098486.

Baehler, D. and Rérat, P. (2020). Beyond the car. Car-free housing as a laboratory to overcome the "system of automobility". *Applied Mobilities*. https://doi.org/10.1080/23800127.2020.1860513.

Bahrampour, M., Byrnes, J., Norman, R., Scuffham, P.A. and Downes, M. (2020). Discrete choice experiments to generate utility values for multi-attribute utility instruments: a systematic review of methods. *The European Journal of Health Economics, 21*, 983-992. https://doi.org/10.1007/s10198-020-01189-6.

Bohnet, M. (2007). Influence of land use and transportation system on car ownership.

Boxall and Adamowicz (2002). Understanding Heterogeneous Preferences in Random Utility Models: A Latent Class Approach. *Environmental and Resource Economics, 23,* 421-446. https://doi.org/10.1023/A:1021351721619.

Buehler, R., Pucher, J., Gerike, R. and Götschi, T. (2016). Reducing car dependence in the heart of Europe: lessons from Germany, Austria, and Switzerland. *Transport Reviews, 37 (1),* 4-28. https://doi.org/10.1080/01441647.2016.1177799.

Bunschoten, T., Molin, E. and Van Nes, R. (2013). Tram or bus, does the tram bonus exist? *European Transport Conference 2013.* http://resolver.tudelft.nl/uuid:f248f7c8-c01c-4f9e-832e-9a884c76c409.

Cao, X., Mokhtarian, P. L., & Handy, S. L. (2007). Do changes in neighborhood characteristics lead to changes in travel behavior? A structural equations modeling approach. *Transportation, 34(5),* 535–556. https://doi.org/10.1007/s11116-007-9132-x.

CBS (2019a). *Meer dan 200 maal zoveel personenauto's als in 1927.* https://www.cbs.nl/nl-nl/nieuws/2019/51/meer-dan-200-maal-zo-veel-personenauto-s-als-in-1927.

CBS (2019b). *Nabijheid voorzieningen; afstand locatie, wijk- en buurtcijfers 2019.* Retrieved from: https://opendata.cbs.nl/#/CBS/nl/dataset/84718NED/table.

CBS (2021a). *Huishoudens; samenstelling, grootte, regio, 1 januari.* Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71486NED/table?fromstatweb.

CBS (2021b). *Bevolking; onderwijsniveau en –richting 2003-2021.* Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82816ned/table?dl=8083.

CBS (2022a). *Bevolking op 1 januari en gemiddeld; geslacht, leeftijd en regio.* Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/03759ned/table?fromstatweb.

CBS (2022b). *Autobezit per huishouden, januari 2020.* Retrieved from: https://www.cbs.nl/nl-nl/maatwerk/2022/12/autobezit-per-huishouden-januari-2020.

Centraal Planbureau and KiM Netherlands Institute for Transport Policy Analysis (2009). *Het belang van openbaar vervoer. De maatschappelijke effecten op een rij.* Den Haag. https://www.cpb.nl/sites/default/files/publicaties/download/het-belang-van-openbaar-vervoer-de-maatschappelijke-effecten-op-een-rij.pdf

ChoiceMetrics (2018). *Ngene 1.2, User Manual and Reference Guide.* http://www.choice-metrics.com/NgeneManual120.pdf.

Chorus, C. (2020a). *Discrete choice modeling and the Logit-model. SEN1221, part I, lecture 1.*

Chorus, C. (2020b). *Mixed Logit. SEN1221, part I, lecture 2.*

Christiadi and Cushing, B. (2007). Conditional Logit, IIA, and Alternatives for Estimating Models of Interstate Migration. *Regional Research Institute Working Papers, 65.* https://researchrepository.wvu.edu/rri_pubs/65.

Christiansen, P., Engebretsen, Ø., Fearnley, N. and Hanssen, J.U. (2017a). Parking facilities and the built environment: Impacts on travel behaviour. *Transportation research part A: Policy and Practice, 95,* 198-206. https://doi.org/10.1016/j.tra.2016.10.025.

Christiansen P., Fearnley, N., Hanssen J.U. and Skollerund, K. (2017b). Household parking facilities: relationship to travel behaviour and car ownership. *Transport research Procedia, 25*, 4185-4195. https://doi.org/10.1016/j.trpro.2017.05.366.

Claasen, Y. (2020). *Potential effects of mobility hubs. Intention to use shared modes and the intention to reduce household car ownership*

Clark, B., Chatterjee, K. and Melia, S. (2016). Changes to commute mode: The role of life events, spatial context and environmental attitude. *Transportation Research part A, 89,* 89-105. http://dx.doi.org/10.1016/j.tra.2016.05.005.

Crawford, J.H. (2002). *Carfree cities.* International Books

CROW (2021) *ASVV.* CROW publication 740.

CROW (n.d.). *Voetganger. Welke afstand is men bereid te lopen?* Retrieved from https://www.crow.nl/duurzame-mobiliteit/home/systeemintegratie/voetganger/loopafstanden-in-cijfers#:~:text=Volgens%20de%20ASVV%20(CROW%202004,of%20naar%20haltes%20en%20stations

De Nazelle, A., Nieuwenhuijsen, M.J., Antó, J.M., brauer, M., Briggs, D., Braun-Fahrlander, C., Cavill, N., Cooper, A.R., Desqueyroux, H., Fruin, S., Hoek, G., Panis, L.I., Janssen, N., Jerrett, M., Joffe, M., Jovanovic Andersen, Z., Van Kempen, E., Kingham, S., Kubesch, N., … , Lebret, E. (2011). Improving health through policies that promote active travel: A review of evidence to support integrated health impact assessment. *Environment International, 37 (2011),* 766-777. http://dx.doi.org/10.1016/j.envint.2011.02.003.

De Nies, C.A. (2020). *Car owners' willingness to reside in a car restricted residential area.*

De Vos, J., Derudder, B., Van Acker, V. and Witlox, F, (2012). Reducing car use: changing attitudes or relocating? The influence of residential dissonance on travel behavior. *Journal of Transport Geography, 22,* 1-9. https://doi.org/10.1016/j.jtrangeo.2011.11.005.

De Vos, J. and Alemi, F. (2020). Are young adults car-loving urbanites? Comparing young and older adults' residential location choice, travel behavior and attitudes. *Transportation research part A: Policy and Practice, 132*, 986-998. https://doi.org/10.1016/j.tra.2020.01.004.

De Vos, J., Mouratidis, K., Cheng, L., Kamruzzaman, Md. (2021). Does a residential relocation enable satisfying travel? *Transportation Research part A, 153,* 288-201. https://doi.org/10.1016/j.tra.2021.09.006.

Ellder, E. (2020). What Kind of Compact Development Makes People Drive Less? The "Ds of the Built Environment" versus Neighborhood Amenities. *Journal of Planning Education and Research, 40*, 432-446. https://doi.org/10.1177%2F0739456X18774120.

Ellder, E., Haugen, K. and Vilhelmson, B. (2022). When local access matters: A detailed analysis of place, neighbourhood amenities and travel choice. *Urban Studies, 59*, 120-139. https://doi.org/10.1177%2F0042098020951001.

Erlwein, S. and Pauleit, S. (2021). Trade-Offs between Urban Green Space and Densification: Balancing Outdoor Thermal Comfort, Mobility, and Housing Demand. *Urban Planning, 6 (1),* 5-19. https://doi.org/10.17645/up.v6i1.3481.

Fiebig, D.G., Keane, M.P., Louviere, J. and Wasi, N. (2010). The Generalized Multinomial Logit Model:Accounting for Scale and Coefficient Heterogeneity. *Marketing Science, 29 (3),* 393-421. https://doi.org/10.1287/mksc.1090.0508.

Giles-Corti, B.; Broomhall, M.H., Knuiman, M., Collins, C., Douglas, K., Ng, K., Lange, A. and Donovan, R.J. (2005). Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine, 28 (2),* 169-176. https://doi.org/10.1016/j.amepre.2004.10.018.

Glazener, A. and Khreis, H. (2020). Chapter 16 - Best practices for air quality and active transportation. *Traffic-Related Air Pollution*, 405-435. https://doi.org/10.1016/B978-0-12-818122-5.00016-8.

Gössling, S. (2020). Why cities need to take road space from cars - and how this could be done. *Journal of Urban Design, 25 (4),* 443-448. https://doi.org/10.1080/13574809.2020.1727318.

Greene, W.H. and Hensher, D.A. (2003). A latent class model for discrete choice analysis: contrasts with mixed logit. *Transportation Research part B, 37,* 681-698. https://doi.org/10.1016/S0191-2615(02)00046-2.

Greene, W.H. and Hensher, D.A. (2007). Heteroscedastic control for random coefficients and error components in mixed logit. *Transportation Research Part E: Logistics and Transportation Review, 43 (5),* 610-623. https://doi.org/10.1016/j.tre.2006.02.001.

Guan, X., Wang, D. and Cao, X.J. (2019). The role of residential self-selection in land use-travel research: a review of recent findings. *Transport revieuws, 40(3),* 267-287. https://doi.org/10.1080/01441647.2019.1692965.

Gunawardena, K.R., Wells, M.J. and Kershaw, T. (2017). Utilising green and bluespace to mitigate urban heat island intensity. *Science of the Total Environment, 584-585,* 1040-1055. https://doi.org/10.1016/j.scitotenv.2017.01.158.

Gundlach, A., Ehrlinspiel, M., Kirsch, S., Koschker, A. and Sagebiel, J. (2018). Investigating people's preferences for car-free city centers: A discrete choice experiment. *Transportation research part D: Transport and Environment, Volume 63.* 677-688. https://doi.org/10.1016/j.trd.2018.07.004.

Guo, Y. and Peeta, S. (2020). Impacts of personalized accessibility information on residential location choice and travel behavior. *Travel Behaviour and Society, 19,* 99-111. https://doi.org/10.1016/j.tbs.2019.12.007.

Guo, J., Feng, T. and Timmermans, H.J.P. (2020). Modeling co-dependent choice of workplace, residence and commuting mode using an error component mixed logit model. *Transportation, 47,* 911-933. https://doi.org/10.1007/s11116-018-9927-y.

GWL-terrein (n.d.). *Factsheet 2: Ontstaan en bouw van de milieuwijk*. Retrieved from: https://gwl-terrein.nl/wp-content/uploads/2017/05/factsheet-2-onstaan-final.pdf.

Handy, S. (2017). Thoughts on the meaning of Mark Stevens's Meta-Analysis. *Journal of the American Planning Association, 83 (1),* 26-28. https://doi.org/10.1080/01944363.2016.1246379.

Hauke, J. and Kosswski, T. (2011). Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data. *Quaestiones Geographicae, 30 (2).*

HEI (2010). *Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. A Special Report of the HEI Panel on the Health Effects of Traffic-Related Air Pollution*. Boston. https://www.healtheffects.org/system/files/SR17TrafficReview_Exec_Summary.pdf.

Hensher D.A. and Greene, W.H. (2003). The Mixed Logit model: The state of practice. *Transportation, 30,* 133-176. https://doi.org/10.1023/A:1022558715350.

Hess, S., Ben-Akiva, M., Gopinath, D. and Walker, J. (2011). Advantages of latent class over continuous mixture of Logit models.

Hoogendoorn-Lanser, S., N. Schaap & M.-J. Olde Kalter (2015). The Netherlands Mobility Panel: An innovative design approach for web-based longitudinal travel data collection. *10th International Conference on Transport Survey Methods, Transportation Research Procedia 11 (2015)*, 311-329. https://doi.org/10.1016/j.trpro.2015.12.027.

Hoogendoorn-Lanser, S. and de Haas, M. (2019). *MPN 2019*. KiM Netherlands Institute for Transport Policy Analysis.

Hurtubia, R., Mora, R. and Moreno, F. (2021). The role of bike sharing stations in the perception of public spaces: A stated preferences analysis. *Landscape and Urban Planning, 214. https://doi.org/10.1016/j.landurbplan.2021.104174.*

Kabeldistrict (n.d.). *Plan.* Retrieved from: https://kabeldistrict.nl/plan/.

Khreis, H., May, A.D. and Nieuwenhuijsen, M.J. (2017). Health impacts of urban transport policy measures: A guidance note for practice. *Journal of Transport & Health, 6,* 209-227. https://doi.org/10.1016/j.jth.2017.06.003.

KiM Netherlands Institute for Transport Policy Analysis, KiM (2021). *Mobiliteitsbeeld 2021. Bekroonde mobiliteit* (KiM-21-A018). https://www.kimnet.nl/publicaties/publicaties/2021/11/18/mobiliteitsbeeld-2021.

KiM Netherlands Institute for Transport Policy Analysis (2022a) *Verklaringen voor de verschillen in autobezit bij Nederlandse huishoudens*. Den Haag.

KiM Netherlands Institute for Transport Policy Analysis. (2022b) *De maatschappelijke effecten van het wijdverbreide autobezit in Nederland*. Den Haag.

Kim, H.C., Nicholson, A. and Kusumastuti, D. (2017). Analysing freight shippers mode choice preference heterogeneity using latent class modelling. *Transportation Research Procedia, 25,* 1109-1125. https://doi.org/10.1016/j.trpro.2017.05.123.

Kirschner F. and Lanzendorf, M. (2019) Parking management for promoting sustainable transport in urban neighbourhoods. A review of existing policies and challenges from a German perspective. *Transport Reviews, 40*, p54-75. https://doi.org/10.1080/01441647.2019.1666929.

Kirschner F. and Lanzendorf, M. (2020). Support for innovative on-street parking policies: empirical evidence from an urban neighborhood. *Journal of Transport Geography, 85*, 102726. https://doi.org/10.1016/j.jtrangeo.2020.102726.

Kroesen, M., and van Wee, G. P. (2021). *Autobezit en autogebruik onder jongeren en visies ten aanzien van deelmobiliteit*. Delft University of Technology.

Lee, A.C.K. and Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health, 33 (2),* 212-222. https://doi.org/10.1093/pubmed/fdq068.

Leibling, D. (2014). Parking supply and demand in London. *Transport and Sustainability, 5*, 259-289. https://doi.org/10.1108/S2044-994120140000005013.

Likas, A., Vlassis, N. and Verbeek, J.J. (2003). The global k-means clustering algorithm. *Pattern Recognition, 36 (2),* 451-461. https://doi.org/10.1016/S0031-3203(02)00060-2.

Lincoln-siedlung (n.d.). E-Carpooling: "mein Lincoln mobil". Retrieved from : https://www.lincoln-siedlung.de/mobilitaet/lincoln-mobil.

Lower, A. and Szumilas, A. (2021). Parking Policy as a Tool of Sustainable Mobility-Parking: Standards in Poland vs. European Experiences. *Sustainability, 13*, 11330. https://doi.org/10.3390/su132011330.

Marcheschi, E., Vogel, N., Larsson, A., Perander, S. and Koglin, T. (2022). Residents' acceptance towards car-free street experiments: Focus on perceived quality of life and neighborhood attachment. *Transportation Research Interdisciplinary Perspectives, 14,* 100585. https://doi.org/10.1016/j.trip.2022.100585.

McCormack, G.R., Rock, M., Toohey, A.M. and Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place, 16 (4),* 712-726. https://doi.org/10.1016/j.healthplace.2010.03.003.

McFadden, D. (1981). Econometric models of probabilistic choice. *Structural Analysis of Discrete Data, Cambridge: MIT Press*, 198-272.

McFadden, D. and Train, K. (2000). Mixed MNL models for discrete response. *Journal of Applied Econometrics, 15 (5),* 447-470. https://doi.org/10.1002/1099-1255(200009/10)15:5%3C447::AID-JAE570%3E3.0.CO;2-1.

Melia, S., Barton, H. and Parkhurst, G. (2012). Potential for carfree developments in the UK. *Urban Design and Planning, 166*, 136-145. http://dx.doi.org/10.1680/udap.10.00048.

Melia, S. (2014). Carfree and Low-Car Development. *Parking Issues and Policies (Transport and Sustainability, 5,* 213-233. https://doi.org/10.1108/S2044-994120140000005012.

Midden Delfland (2002). *Look-West: Verkoop eerste fase binnenkort van start*. Retrieved from: http://jaar2002.middendelfland.net/denhoorn/lookwest1.htm.

Ministry of the Interior and Kingdom Relations (2020). *Nationale Omgevingsvisie. Duurzaam perspectief voor onze leefomgeving.*

Mocktarian, P.L. and Cao, X. (2008). Examining the impacts of residential self-selection on travel behavior: A focus on methodologies. *Transportation Research part B, 42,* 204-228. https://doi.org/10.1016/j.trb.2007.07.006.

Mohajerani, A., Bakaric, J. and Jeffrey-Bailey, T. (2017). The urban heat island effect, its causes, and mitigation, with reference to the thermal properties of asphalt concrete. *Journal of Environmental Management, 197,* 522-538. https://doi.org/10.1016/j.jenvman.2017.03.095.

Molin (2017). *The use of basic plans for constructing profiles (alternatives)*

Molin (2021). *Constructing choice sets: Orthogonal designs. Lecture 2, SEN1221, part II.*

Molin, E.J.E. and Maat, C. (2015). Bicycle parking demand at railway stations: Capturing price-walking trade offs. *Research in Transport Economics, 53,* 3-12. http://dx.doi.org/10.1016/j.retrec.2015.10.014.

Molin, E., Oppewal, H. and Timmermans, H. (1996). Predicting consumer response to new housing: A discrete choice experiment. *Netherlands journal of housing and the built environment, 11,* 297-311.

Moreno, C. (2021). *The 15-minute city.* TED. Retrieved from: https://www.ted.com/talks/carlos_moreno_the_15_minute_city?language=en.

Moreno, C., Allam, Z., Chabaud, D., Gall, C. and Pratlong, F. (2021). Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart cities, 4 (1),* 93-111. https://doi.org/10.3390/smartcities4010006.

MRA Platform Smart Mobility (2021). *Leidraad Gebiedsontwikkeling & Smart Mobility. Versie 2.0*. Amsterdam. https://smartmobilitymra.nl/wp-content/uploads/2021/07/MRA-smart-mobility-leidraad-V9.pdf.

Municipality of Amersfoort (2022). *Gemeente Amersfoort in cijfers.* https://amersfoortincijfers.nl/jive.

Municipality of Amsterdam (2014). *Bestemmingsplan De Houthaven 2013. Bestemmingsplan voor vaststelling. Toelichting*.

Municipality of Amsterdam (2017). *Stedenbouwkundig Plan Sluisbuurt.* Retrieved from: https://www.amsterdamsebinnenstad.nl/archief/sluisbuurt/concept_stedenbouwkundigplan_sluisbuurt.pdf.

Municipality of Amsterdam (2020). *Amsterdam maakt ruimte. Agenda Amsterdam autoluw.* Municipality of Amsterdam, Traffic and Public Space.

Municipality of Amsterdam (2022). *Deelvervoer.* Retrieved from: https://kaart.amsterdam.nl/deelvervoer#52.3726/4.8395/52.3900/4.9054/brt/14264,14265,14331//.

Municipality of Amsterdam (n.d.). *IJburg: nieuwe eilanden en woningbouw*. Retrieved from: https://www.amsterdam.nl/projecten/ijburg/.

Municipality of Delft (2021). *Omgevingsvisie Delft 2040. Samen maken we de stad!*

Municipality of Delft and BURA urbanism (2021). Schieoevers Noord Delft. Ruimtelijk kwaliteitskader. BURA urbanism. Amsterdam. https://media.delft.nl/pdf/Schieoevers/Ruimtelijk-kwaliteitskader-Schieoevers-Noord.pdf.

Municipality of Delft and marco.broekman (2019). *Schieoevers Noord Delft, Ontwikkelplan*. marco.broekman. Amsterdam. https://delft.notubiz.nl/document/8948238/1#search=%22ontwikkelplan-schieoevers-noord%22.

Municipality of Delft (2022). *Delft in cijfers.* https://delft.incijfers.nl/jive.

Municipality of Haarlem (2021). *Omgevingsvisie Haarlem 2045. Toekomstbestendig, vergroenen, verbinden en ontmoeten*. Retrieved from: https://haarlem.nl/sites/default/files/2022-06/Omgevingsvisie%20Haarlem%202045.pdf.

Municipality of Rotterdam (2020). *Rotterdamse Mobiliteitsaanpak*. Retrieved from: https://www.rotterdam.nl/wonen-leven/mobiliteitsaanpak/Rotterdamse-Mobiliteitsaanpak1.pdf.

Municipality of Rotterdam (2022). *Onderzoek010*. https://onderzoek010.nl/jive.

Municipality of Utrecht (2020). *Leefbare stad en maatschappelijke voorzieningen. Koersdocument.* Retrieved from: https://omgevingsvisie.utrecht.nl/fileadmin/uploads/documenten/zz-omgevingsvisie/koers/2020-03-koersdocument-leefbare-stad-en-maatschappelijke-voorzieningen.pdf.

Municipality of Utrecht, BPD Ontwikkeling, Janssen de Jong, Greystar, AM, Synchroon, Boelens de gruyter, G&S Vastgoed, Round Hill Capital, Lingotto, 3T Vastgoed, BURA urbanism, OKRA Landschapsarchitecten, MARK RABBIE urban concepts, Stadkwadraat, Goudappel Coffeng, RebelGroup, Merosch, Unchain the Tigers, Impuls and Kassing Notuleerservice (2021). *Stedenbouwkundig Plan Merwede*. BURA urbansim. https://omgevingsvisie.utrecht.nl/fileadmin/uploads/documenten/wonen-en-leven/bouwprojecten-en-stedelijke-ontwikkeling/bouwprojecten/merwedekanaalzone/stadswijk-merwede/2020-11-stedenbouwkundig-plan-merwede.pdf.

Municipality of Zwolle (2021). *Mijn Zwolle van morgen 2030*, *Omgevingsvisie.* Retrieved from: https://www.zwolle.nl/sites/default/files/bijlage-3-omgevingsvisie-2021-v3.pdf.

Mokhtarian, P.L. and Cao, X. (2008). Examining the impacts of residential self-selection on travel behavior: A focus on methodologies. *Transportation Research part B: Methodological, 42(3).,* p204-228. https://doi.org/10.1016/j.trb.2007.07.006.

Mueller, N., Rojas-Rueda, D., Basagaña, X., Cirach, M., Hunter, T.C., Dadvand, P., Donaire-Gonzalez, D., Foraster, M., Gascon, M., Martinez, D., Tonne, C., Triguero-Mas, M., Valentín, A. and Nieuwenhuijsen, M.J. (2017). Urban and transport planning related exposures and mortality: A health impact assessment for cities. *Environmental Health Perspectives, 125 (1).* https://doi.org/10.1289/EHP220.

Nieuwenhuijsen, M.J. (2016). Urban and transport planning, environmental exposures and health-new concepts, methods and tools to improve health in cities. *Environmental health, 15 (Suppl. 1, S38).* https://doi.org/10.1186/s12940-016-0108-1.

Nieuwenhuijsen M. J. and Khreis, H. (2016). Car free cities: pathway to healthy urban living. *Environment International. Volume 94.* 251-262. https://doi.org/10.1016/j.envint.2016.05.032.

Nieuwenhuijsen, M.J. (2020). Urban and transport planning pathways to carbon neutral, liveable and healthy cities; A review of the current evidence. *Environment International, 140,* 105661. https://doi.org/10.1016/j.envint.2020.105661.

Nieuwenhuijsen, M. (2021). New urban models for more sustainable, liveable and healthier cities post covid19; reducing air pollution, noise and heat island effects and increasing green space and physical activity. *Environment International, 157,* 106850. https://doi.org/10.1016/j.envint.2021.106850.

Nordlund, A.M. and Garvill, J. (2003). Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *Journal of Environmental Policy. Volume 23.* 339-347. https://doi.org/10.1016/S0272-4944(03)00037-9.

Puhe, M. and Schippl, J. (2014). User Perceptions and Attitudes on Sustainable Urban Transport among Young Adults: Findings from Copenhagen, Budapest and Karlsruhe. *Journal of Environmental Policy and Planning, 16,* 337-357. https://doi.org/10.1080/1523908X.2014.886503.

Rau, A. (2018). *Transport and the Environment. Topic 1: Transport and air pollution.* Technical University of Munich.

Revelt, D. and Train, K. (1998). Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level. *The Review of Economics and Statistics, 80 (4),* 647-657. https://doi.org/10.1162/003465398557735.

Rose, J.M. and Bliemer, M.C.J. (2009). Constructing Efficient Discrete choice experimental Designs. *Transport Reviews, 29 (5),* 587-617. https://doi.org/10.1080/01441640902827623.

Rotterdam Makers District (2019). *Ruimtelijk Raamwerk Merwe-Vierhavens Rotterdam. Toekomst in de maak*. https://m4hrotterdam.nl/wp-content/uploads/2019/07/DLA-M4H-17028-Boekwerk-190627-LQ.pdf.

Rotterdam Makers District (2022). *Mobiliteitsstrategie Merwede-Vierhavens.* https://m4hrotterdam.nl/wp-content/uploads/2022/02/M4H_mobiliteitsstrategie_DEF.pdf.

Scherer, M. (2010). Is light rail more attractive to users than bus transit? Arguments based on cognition and rational choice. *Transportation research record, 2144,* 11-19. https://doi.org/10.3141%2F2144-02.

Selzer, S. (2021). Car-reduced neighborhoods as blueprints for the transition toward an environmentally friendly urban transport system? A comparison of narratives and mobility-related practices in two case studies. *Journal of Transport Geography, 96,* 103-126. https://doi.org/10.1016/j.jtrangeo.2021.103126.

Selzer S. and Lanzendorf M. (2019) On the road to sustainable urban and transport development in the automobile industry. Traced narratives of car-reduced neighbourhoods. *Sustainability, 11*, 4375. https://doi.org/10.3390/su11164375.

Selzer and Lanzendorf (2022). Car independence in an automobile society? The everyday mobility practices of residents in a car-reduced housing development. *Travel Behaviour and Society, 28,* 90-105. https://doi.org/10.1016/j.tbs.2022.02.008.

Stadtteil-Vauban (n.d.). *Verkehr, Geschichte und Hintergrund der Verkehrskonzept Vauban.* Retrieved from: https://stadtteil-vauban.de/verkehr/.

Stubbs, M. (2002). Car Parking and Residential Development: Sustainability, Design and Planning olicy, and Public Perceptions of Parking Provision. *Journal of Urban Design, 7(2),* 213-237. https://doi.org/10.1080/1357480022000012249.

The Economist Intelligence Unit (2021). *The Global Liveability Index 2021. How the Covid-19 pandemic affected liveability worldwide.*

Train, K. (2000). Halton Sequences for Mixed Logit. *UC Berkeley: Department of Economics.* Retrieved from https://escholarship.org/uc/item/6zs694tp.

Train, K. (2002). Discrete Choice Methods with Simulation.

Van Acker, V., Van Wee, B. and Witlox, F. (2010). When Transport Geography Meets Social Psychology: Toward a Conceptual Model of Travel Behaviour. *Transport Reviews, 30 (2),* 219-240. https://doi.org/10.1080/01441640902943453.

Van de Coevering, P., Maat, K. and Van Wee, B. (2018). Residential self-selection, reverse causality and residential dissonance. A latent class transition model of interactions between the built environment, travel attitudes and travel behavior. *Transportation Research part A, 118,* 466-479. https://doi.org/10.1016/j.tra.2018.08.035.

Van Wee, B., Holwerda, H. and van Baren, R. (2002). Preferences for Modes, Residential Location and Travel Behaviour: the Relevance for Land-Use Impacts on Mobility. *Impacts on Mobility. European Journal of Transport and Infrastructure Research, 2(4),* 305-316. https://doi.org/10.18757/ejtir.2002.2.4.3729.

Van Wee, B. (2009). Self-Selection: A Key to a Better Understanding of Location Choices, Travel Behaviour and Transport Externalities? *Transport Reviews, 29 (3),* 279-292. https://doi.org/10.1080/01441640902752961.

Veldwijk, J., Lambooij, M.S., De Bekker-Grob, E.W., Smit, H.A., and de Wit, G.A. (2014). The Effect of Including an Opt-Out Option in Discrete Choice Experiments. *PLoS ONE, 9 (11).* https://doi.org/10.1371/journal.pone.0111805.

Wang, J., Dane, G.Z. and Timmermans, H.J.P. (2021). Carsharing-facilitating neighbourhood choice: a mixed logit model. *Journal of Housing and the Built Environment, 36,* 1033-1054. https://doi.org/10.1007/s10901-020-09791-z.

References of figures

Municipality of Utrecht (2021). *Mobiliteitsplan 2040, jouw straat en onze stad gezond, aantrekkelijk en bereikbaar voor iedereen.*

Appendices

A. Paper

The paper can be found on the next pages

Preferences of potential residents for car-reduced neighbourhoods

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September 2022

Many cities are planning car-reduced neighbourhoods, to provide more housing and stimulate sustainable mobility. Nonetheless, it is important to know what potential residents value, to be able to attract them. This study investigated the preferences of potential residents regarding the accessibility of car-reduced neighbourhoods, available amenities, green and amenities in public space. It revealed that the car is still very important when deciding where to live. Also, other forms of transport are important, especially if one wants to relinquish his car. Nonetheless, this study also shows that car-reduced neighbourhoods are able to attract car-owning residents, especially when a train station is available and cars have access, but with limitations.

Keywords: Car-reduced neighbourhood, car-free, residential self-selection, sustainable mobility, urban development

1. Introduction

Since the 1960s, car-ownership rapidly increased in Europe, including the Netherlands (CBS, 2019a; Nordlund and Garvill, 2003). Nowadays, awareness of the drawbacks of the car is growing. These include emissions which are harmful to life and climate, noise, a decreased level of safety (Nieuwenhuijsen and Khreis, 2016; Selzer and Langendorf, 2019; Baehler and Rérat, 2020; HEI, 2010; Rau, 2018; Gössling, 2020). Besides, cars use a lot of space, even though they are parked for 23h a day (Municipality of Amsterdam, 2020; Kirschner and Lanzendorf, 2019; Kennisinstituut voor Mobiliteitsbeleid (KiM), 2022). Nonetheless, space is scarce, due to the housing crisis, and thus space for new residences is required. However, space is not only required for the houses themselves, but also for supporting amenities, and public space which ensures a liveable neighbourhood ((Ministry of the Interior and Kingdom Relations, 2020; MRA Platform Smart Mobility, 2021). The Dutch national spatial vision (Omgevingsvisie) steers towards a reduction of car-usage and car-presence, and sustainable transport modes which are also more space efficient should be stimulated (Ministry of the Interior and Kingdom Relations, 2020).

The realisation of car-reduced neighbourhoods can contribute to both providing more houses, and a reduction in car-usage (Crawford, 2000; Melia, 2014; Nieuwenhuisen and Khreis, 2016; Selzer and Lanzendorf, 2019; Moreno et al., 2021; Marcheschi et al., 2022). Many municipalities are planning car-reduced neighbourhoods on a large scale (Municipality of Amsterdam, 2013; Municipality of Amsterdam, 2017; Municipality of Utrecht, 2021; marco.broekman, 2019; Municipality of Haarlem, 2021; Municipality of Zwolle, 2021; Rotterdam Makers District, 2019). The size of these neighbourhoods distinguishes them from existing car-reduced neighbourhoods, those being realised nowadays are much larger. For example, the Merwedekanaalzone is supposed to inhabit about 12,000 residents. Characteristics of these neighbourhoods are:

1) Limited access for cars and limited provided parking, which is eventually separated from the residence (Melia et al., 2012; Selzer and Lanzendorf, 2022).
2) Stimulated use of sustainable mobility (other than the car): public transport, shared mobility, cycling and walking by providing easy access to them (Selzer, 2021; Niewenhuijsen, 2021).
3) Stimulated use of active modes by providing multiple amenities within the neighbourhood itself (Crawford, 2000; Moreno et al., 2021).
4) High quality of public space with much green and which stimulates interaction amongst people, as the low number of cars allows to use public space differently (Nieuwenhuijsen and Khreis, 2016; Nieuwenhuijsen, 2021; Moreno et al., 2021).

Literature reviews that inhabitants of these neighbourhoods reduce their car-usage (Selzer, 2021; Melia et al., 2012), thus if preferences of potential residents are known, these neighbourhoods could be developed such that many want to live in them, and thereby reduce car-usage. These preferences are valuable knowledge to municipalities, as it helps to make choices (Municipality of Amsterdam, 2020; Municipality of Rotterdam, 2020; Municipality of Haarlem, 2021; Municipality of Delft, 2022). This is also valuable to project developers, as they might be reluctant regarding car-reduced neighbourhoods, as the car has become normal to residents, and is embedded in urban designs (Selzer, 2021; Melia et al., 2012). Lastly, this study is valuable from a scientific point of view. As the literature review will show, most literature focuses on either one or two of the mentioned characteristics, and not on the trade-off of the four of them, especially not by potential residents.

To investigate this, the following research question has been used: *To what extent is the willingness to live in a car-reduced neighbourhood influenced by the availability of alternative transport modes, the accessibility of amenities and liveability?*

This study answers this question using a discrete choice experiment, which is analysed via an error component mixed logit (ML) model, which accounts for socio-demographic differences. Scoping is however required. This study focuses on new neighbourhoods and not on the reconstruction of existing neighbourhoods, because new neighbourhoods allow more freedom in the design, due to the spatial structure which still has to be developed. This study does not focus on details of car-reduced neighbourhoods, such as the supply of amenities, or the access for disabled persons or emergency services. Also, the economics of these neighbourhoods has been left out.

The remainder of this paper is as follows: Chapter 2 describes the method of this study, followed by the analysis in chapter 3. Chapter 4 gives the results, which are applied to real and planned neighbourhoods in chapter 5. Lastly, the conclusion and discussion including recommendations are given.

2. Methodology

The main part of this study is formed by a discrete choice experiment. To construct this experiment, literature has been used and multiple experts were interviewed. Scientific literature reveals what is required for successful car-reduced neighbourhoods, and gives more information related to the characteristics as given in the introduction. Experts are able to share their experiences and thereby broaden the view of the researcher. After all, developing a neighbourhood is not related to mobility or liveability only, but a combination of them and many other factors. Therefore, experts with different backgrounds have been interviewed. Included experts were sustainable mobility experts from two companies (Arcadis and Over Morgen), an urban planner from Arcadis, Professors from the department of Urbanism from the faculty of Architecture of Delft University of Technology and employees from several municipalities.

A discrete choice experiment is a method to reveal how respondents trade off different attributes, and thereby, the importance of individual attributes can be estimated, under the assumption that respondents strive for utility maximisation (McFadden, 1986; Molin et al., 1996). The discrete choice experiment consisted of eight attributes per neighbourhood, three levels each. Using Ngene, 27 choice sets, containing two alternatives each, have been constructed. These were divided into three blocks, to limit the number of choice sets per respondent. The resulting nine choice sets should be doable (Bahrampour et al., 2020; Molin, 2021). In every choice set, respondents were asked for their preferred neighbourhood and whether they would want to live in that neighbourhood. If so, it was also asked what the likelihood was that they would relinquish their car. The choice sets were presented to respondents in a digital survey, constructed via Qualtrics under a license of the TU Delft. It also included questions regarding socio-demographics, attitudes and transport behaviour and preferences to be able to account for them in the analysis.

The survey was at first only distributed via flyers, but later on also via social media as the flyers did not result in many respondents. Flyers were distributed in three cities in the Netherlands, Rotterdam, Delft and Amersfoort. Cities were chosen because car-reduced neighbourhoods are to be realised primarily in cities, and current inhabitants of cities are regarded as more likely to relocate to a car-reduced neighbourhood in a city, than persons who do not live in a city currently. Three cities have been chosen to prevent results which are only applicable to that city, because of similarities of the residents of that city. Rotterdam is a large city in the Randstad, while Delft is much smaller. Amersfoort is well connected to the Randstad, but also to the rural region east of it, which gives it a different function. Within these cities, flyers are distributed in multiple neighbourhoods. These have been selected using K-means clustering to ensure that different types of neighbourhoods, and thus different types of households, would be included. Multiple clusters were created based on the average age, household size, income and car-ownership of households. For every cluster, the most representative neighbourhood(s) was selected. In case of clusters containing many neighbourhoods, multiple neighbourhoods were chosen, to obtain a more representative sample. Nonetheless, not all responses were used in the analysis, because not all respondents were likely to relocate to a car-reduced neighbourhood. Persons for whom it was very important to park the car close to their house, which is usually not possible in car-reduced neighbourhoods, were excluded.

For the analysis, it was assumed that people strive for utility maximisation (McFadden, 1986)), and thereby choose the neighbourhood with the largest utility. The utility U_i of neighbourhood (alternative) i can be described as:

$$U_i = V_i + \epsilon_i \; (1)$$

with V_i being the systematic part and ϵ_i as the random part, to reflect unobserved factors (Molin and Maat, 2015; Chorus, 2020a). The utility is influenced by the attributes of a neighbourhood, and the weight given to them according to the tastes of the choice-maker (See figure2.1. The systematic part of alternative i is the sum of individual attributes levels of that alternative, x_{ik}, multiplied with their weight β_k:

$$V_i = \sum_{k=1}^{K} \beta_k * x_{ik} \quad (2)$$

Attributes are characteristics of a neighbourhood, such as the possibility to enter the neighbourhood by car.

If the random part is assumed to be independently and identically distributed (IID) Extreme value type 1, this results in the multinomial logit (MNL) model. The probability P of respondent n choosing neighbourhood i out of set J, with β as vector with taste coefficients for the attributes, is according to the MNL-model (Hess et al., 2011):

$$L_n(i \mid \beta) = \frac{e^{\beta' x_{ni}}}{\sum_{j=1}^{J} e^{\beta' x_{nj}}} = \frac{e^{V_{ni}}}{\sum_{j=1}^{J} e^{V_{nj}}} \quad (3)$$

This model does however not account for heterogeneity amongst respondents. This can be included using interactions (Guo et al., 2020). Another method to account for heterogeneity would be the use of a random parameter mixed logit (ML) model. However, this would reveal heterogeneity, including its size, but not explain its cause (Greene and Hensher, 2007), and thus, knowledge about heterogeneity cannot be applied in the realisation of neighbourhoods.

This study first estimated multiple MNL-models, with an interaction with a group of characteristics. MNL-models were used because these are much easier to estimate than, for example, ML-models. Used groups are socio-demographics, attitudes, transport mode preferences and the preferred location of the neighbourhood (level of urbanity). This reveals which interactions are best able to explain heterogeneity amongst respondents. For every MNL-model with interactions, at first, all expected interactions were added. The interactions which were insignificant for both levels of an attribute were removed stepwise: in each step, the least significant interaction was removed. Attributes themselves were not removed, even if their estimated betas turned out to be insignificant. Removing them would seem like the attribute has no effect at all, and it would no longer be possible to see what effect it has, even though it is possibly zero (Amrheim et al., 2019).

The MNL-model with interactions which explains most of the data, including heterogeneity, was used to create an error component ML model. Where the MNL-model contained only two alternatives, a third alternative was added for persons who preferred a neighbourhood, but were not willing to live in the neighbourhood of their preference. This third alternative thus acts as an opt-out and was given a utility of 0. A constant was added to the other alternatives, which represent a preferred neighbourhood where the respondent wants to live. This constant reveals the difference in utility between a neighbourhood where one wants to live, and where someone does not want to live. The constant also has a random error component, which allows to reveal unobserved heterogeneity (Veldwijk et al., 2014; Train, 2002). Another benefit of the ML-model is that it, due to the random component, relaxes the IIA (independence of irrelevant alternatives) property of the MNL (Christiadi and Cushing, 2007; Fiebig et al., 2010). The estimated parameters of this ML-model reveal the importance of attribute levels, and using the interactions, the importance for different household types can be estimated.

It is also valuable to know how characteristics of the neighbourhood, but also of a household, influence whether it is likely that someone wants to relinquish his car. To estimate this for the neighbourhood characteristics, an error component ML-model was estimated. Now, the opt-out was for respondents who were neutral or unlikely to relinquish their car. If someone was likely to relinquish his car, the chosen alternative was the preferred neighbourhood. This model did not contain any interactions, since these led to unreliable estimates. For the other groups of characteristics, socio-demographics, attitudes, transport mode preferences and the preferred location of the neighbourhood, the correlation with the likelihood to relinquish the car was estimated using SPSS.

Lastly, results of the ML-model for the willingness to live in a neighbourhood were applied to real neighbourhoods. Recently built car-included neighbourhoods, as well as (planned) car-reduced neighbourhoods were included in this comparison, to be able to compare relatively new neighbourhoods. Characteristics of these neighbourhoods are expressed using the attribute levels. These do of course not perfectly fit to the characteristics, but levels have been chosen such that they give the best possible representation. For every neighbourhood, its utility is calculated, using the estimates from the model for the choice for a neighbourhood. This was done from the perspective of all household types which could be created using the interaction. Because of the random component and because the formula to calculate the probability that a household prefers a certain neighbourhood is not in closed form, simulation is required. This is done according to formula 4, with r being the number of the draw out of the set of R draws and $L_{n,I}$ as stated in formula 3 (Train, 2002).

$$\check{P}_{n,i} = \frac{1}{R}\sum_{r=1}^{R} L_{n,i}(\beta^r) \quad (4)$$

The number of draws was increased until the estimated choice-probabilities for neighbourhoods stabilises. This reveals which household types prefer which types of neighbourhoods. It also allows to reveal a general preference for car-reduced or car-included neighbourhoods, although no hard conclusions can be drawn, as the set of selected neighbourhoods is not representative for car-reduced nor car-included neighbourhoods in the Netherlands.

3. Literature overview

The introduction gave four aspects which characterise car-reduced neighbourhoods: 1) reduced access for cars, 2) stimulation of public transport and shared vehicles, 3) providing amenities in the neighbourhood itself to stimulate active modes and 4) public space of high quality to stimulate liveability and health. This overview elaborates on these characteristics, as well as the opinion of potential residents regarding them. Next to that, this overview describes how they can contribute to a reduction in car-ownership.

3.1 Reduced access for cars

Reducing access has two components: 1) reducing their access to streets, and 2) limiting the number of parking spots. The first component ranges from reducing through traffic, but allowing local traffic in the neighbourhood, to a car-free neighbourhood where cars do not have access. Melia et al. (2012) give three models:

1) Limited access model, where cars do not have access except for parking at the edge of a neighbourhood in some cases.
2) Vauban model, where cars have access via the main street, but are not allowed to park in the area, except for loading/unloading.
3) Pedestrian zones in city centres, but these are intended for primarily commercial areas and not for residential areas.

Based on realised and planned car-reduced neighbourhoods, the following categories can be distinguished:

1) Car-free neighbourhoods with parking at the edges, such as the Merwedekanaalzone and GWL-terrain (Municipality of Utrecht et al., 2021; GWL-terrein, n.d.)
2) Car-reduced neighbourhoods where cars are allowed to drop off/pick up goods, but parking is provided at central locations at the edge, for example, Schieoevers-North (Municipality of Delft and BURA urbanism, 2021).
3) Car-reduced neighbourhoods with several main streets for cars and central parking locations throughout the neighbourhood. For example Merwe-Vierhavens Merwe-Vierhavens in Rotterdam (Rotterdam Makers District, 2019).
4) Car-reduced neighbourhoods where cars have (almost) full access, but can only be parked at several central locations. An example is the Sluisbuurt in Amsterdam (Municipality of Amsterdam, 2017).

The second component uses parking. Car-reduced neighbourhoods usually feature a low parking norm, to reduce the number of cars (Kirschner and Lanzendorf, 2019; Lower and Szumilas, 2021, Christiansen et al., 2017a; Selzer and Lanzendorf, 2019). Parking norms of 0.5 or lower are not uncommon (Melia et al., 2012; Selzer and Lanzendorf, 2019; Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021). Another effective method is separating parking and residence (Kirschner and Lanzendorf, 2019; Christiansen et al., 2017a; Selzer and Lanzendorf, 2019). This is a very effective measure: a distance as small as 50m already induces a reduction in car-usage (Christiansen et al., 2017a and 2017b). Nonetheless, if the walking distance is too large (and thus parts of the neighbourhood become car-free), car-owners will be less likely to relocate to the neighbourhood, reducing the neighbourhood's potential to reduce car-usage and car-ownership (Melia et al., 2012; De Nies, 2020).

Residents must support measures, to make them effective. Generally, people support the need for more sustainable transport (Selzer and Langendorf, 2019; Ellder et al., 2022, Kirschner and Langendorf, 2020). Especially car-owners are reluctant regarding car-reducing measures, but if they understand the measures, they might accept them (Selzer, 2021).

3.2 Sustainable mobility

Solely restricting the access for cars to neighbourhoods and/or limiting parking is not sufficient to reduce car-usage. Alternatives must be available and accessible (Leibling, 2014; Selzer, 2021). Alternative modes are public transport, cycling, walking and shared vehicles (Selzer and Lanzendorf, 2019; Baehler and Rérat, 2020; Ellder et al., 2022). Car-reduced neighbourhoods are usually (planned to be) situated close to public transport (Baehler, 2019; Selzer, 2021; Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021;

Municipality of Delft and marco.broekman, 2019; Rotterdam Makers District, 2019), which is important since the longer the distance to the stop, the more people will use their car (Ellder, 2020).

Public transport is important to residents of car-reduced neighbourhoods (Melia et al., 2012; Baehler and Rérat, 2020), and improvements in public transport stimulate people to relinquish their cars (Melia et al., 2012). The most important improvements are a reduction in fees and an increase in supply (Kirschner and Langendorf, 2020). Next to public transport, safe infrastructure for cycling is very important to residents (Baehler and Rérat, 2020; Kirschner and Langendorf, 2020), and increases the acceptance of car-reduction measures (Gundlach et al., 2018). Shared vehicles are not as important as public transport and the bicycle (Baehler and Rérat, 2020; Kirschner and Langendorf, 2020), but are still used by many residents of car-reduced neighbourhoods (Baehler and Rérat, 2020).

3.3 Proximity of amenities

Having amenities in the neighbourhood itself is crucial to stimulate walking and cycling (Ellder, 2020; Ellder et al., 2022, De Nies, 2020) and improves the liveability of a neighbourhood (Moreno, 2021). The more amenities are present in a neighbourhood, the fewer cars are used and the more active modes are used (Ellder et al., 2022). This characteristic is also important to residents of car-reduced neighbourhoods, especially the presence of shops for daily needs (Baehler and Rérat, 2020). Restaurants are less important (Baehler and Rérat. 2020), which is logical since they are usually not used regularly.

3.4 Quality of public space

Multiple studies agree that more green is needed in cities to improve health and liveability, and that especially space which is nowadays used by polluting cars should be used for this (Nieuwenhuijsen and Khreis, 2016; Nieuwenhuijsen, 2020; Mueller et al., 2017; Gössling, 2020). Green in cities has many benefits:

1) It improves physical and mental health, amongst others by reducing air pollution and stimulating physical activities (Lee and Maheswaran, 2011; Nieuwenhuijsen and Khreis, 2016; Mueller et al., 2017).
2) It stimulates interaction amongst people (Nieuwenhuijsen and Khreis, 2016; Moreno, 2021).
3) It stimulates the use of active modes (Glazener and Khreis, 2020), which also improves health and stimulates interaction compared to other transport modes.
4) It can reduce the effects of urban heating and thereby improves liveability (Mohajerani et al., 2017; Erlwein and Pauleit, 2021).

Green can be available in many forms: e.g. roofs, facades and parks. Regarding the latter, large parks are preferred over small ones, because they can provide more different activities (McCormack, 2010; Giles-Corti, 2005). Many urban visions reveal that green is important in the design of neighbourhoods (Municipality of Amsterdam, 2017; Municipality of Utrecht et al., 2021; Municipality of Delft and marco.broekman, 2019; Rotterdam Makers District, 2019); public space and roofs in the Merwedekanaalzone in Utrecht should be green, unless space is required for different purposes (Municipality of Utrecht et al., 2021).

Kirschner and Lanzendorf (2020) show that transforming parking spots into areas which improve liveability receive support, but primarily amongst those who do not use their car frequently. Gundlach et al. (2018) show that the addition of recreational areas is supported when making a city car-free, but that public transport and bicycle infrastructure are more important.

3.5 Reducing car-ownership

One of the reasons municipalities plan car-reduced neighbourhoods is to reduce car-ownership. Melia (2014) reveals that multiple existing car-reduced neighbourhoods did so, ranging between 10 and 62% decrease. However, Selzer (2021) shows that some households relinquished their second car, but that many households kept their first car.

Relocation is a moment when people are likely to change their mobility behaviour, including relinquishing their car (Clark et al., 2016; Aguilera and Cacciari, 2020). Relocating to a neighbourhood with good connections by high-quality public transport reduces car-usage and car-ownership (Clark et al., 2016). This applies especially to neighbourhoods in the centre where households have good access to destinations without using the car (Bohnet, 2007; KiM., 2022a). This also indicates that providing a diverse range of amenities in the neighbourhood is likely to reduce car-ownership. Liao et al. (2020) and Claasen (2019) reveal that the availability of shared vehicles can reduce car-ownership with respectively 20% and 15%. Applying a low parking norm and separating residence and parking can reduce car-ownership (Christiansen et al., 2017a).

This section gave a brief overview of how different characteristics and policies influence car-ownership. Nonetheless, a set of policies is required to reduce car-ownership (Leibling, 2014; Buehler et al., 2016), not just single measures. Besides, other factors such as attitudes also influence car-ownership, thus hard policies should be combined with other more attitude-changing policies (De Vos et al., 2012; Buehler et al., 2016). It is important to keep in mind that society is still focused on the car (Selzer and Lanzendorf, 2019). This also applies to young adults (Selzer, 2021): even though they are more open to new concepts such as sustainable mobility (Gundlach et al., 2018; Puhe and Schippl, 2014), they expect and plan to use the car in the future (Puhe and Schippl, 2014).

4. Survey design and data collection

The main part of the survey consists of the discrete choice experiment, where respondents had to state their preference for a neighbourhood, and state whether they would like to live in their preferred neighbourhood and what the likelihood is that they would relinquish their car when moving there. Neighbourhoods were described using eight attributes with three levels. Table 1 gives an overview of the levels and the attributes. Table 2 gives an example of a choice set that respondents could encounter in the survey.

Table 5, Attributes and their levels.

Attribute	Attribute levels		
Access for cars	With 30 km/h	With 5 km/h	No access
Walking distance to parking from home	<1 min (Car close to home)	4 min (300 m)	8 min (600 m)
Available transport services	Bus	Bus + Tram	Bus + Tram + Train
Available shared mobility	No shared vehicles	Shared car	Shared car and electric (transport) bike
Walking distance to transport services	<1 min (stop close to home)	4 min (300m)	8 min (600m)
Amenities within 5 minutes (400m) walking	Supermarket Primary school	Supermarket Primary school (Non-)food shops	Supermarket Primary school (Non-food) shops Restaurants and cafes
Green in the neighbourhood	Some green in every street and multiple small parks	Some green in every street and a large central park	Much green in every street, but no additional park
Amenities in public space	Benches	Benches Playgrounds	Benches Playgrounds Outdoor sport facilities

Table 6, Example of a choice set

	Neighbourhood 1	Neighbourhood 2
Access for cars	No access	Access with 5 km/h
Walking time to parking	<1 min (car close to house)	4 min walking (300m)
Available public transport	Bus, tram and train	Bus
Available shared vehicles	Not available	Shared cars
Walking time to public transport and shared vehicles	<1 min (close to house)	<1 min (close to house)
Amenities within 5 minutes walking	Supermarket, primary school and (non) food shops	Supermarket and primary school
Green in the neighbourhood	Green in the street and one large park	Green in the street and one large park
Amenities in public space	Benches, playgrounds and outdoor sports facilities	Benches
Which neighbourhood would you prefer?	4. Neighbourhood 1 5. Neighbourhood 2	
Would you like to live in your preferred neighbourhood?	o Yes o No	
If you moved to this neighbourhood, what is the likelihood that you would relinquish a car?	- Very likely - Likely - Neither likely/unlikely - Unlikely - Very unlikely	

Table 7, Descriptive statistics of the sample, Rotterdam (RTM), Delft (DFT), Amersfoort (AMF) and the Netherlands in general

Age	Sample	RTM	DFT	AMF	NL	Education level	Sample	RTM	DFT	AMF	NL
18-39 years	30.6%	43.5%	49.1%	26.2%	36.3%	Low	14.9%	31.4%	20.4%	23.3%	29.8%
40-64 years	50.5%	37.4%	31.8%	44.0%	41.4%	Middle	24.8%	37.6%	35.6%	36.2%	37.3%
≥65 years	18.9%	19.1%	19.1%	19.9%	24.4%	High	60.3%	31.0%	44.0%	40.6%	32.9%
Household composition						**Income level**					
Single without children	29.1%	43.7%	53.5%	34.1%	35.9%	Low (<€40.000)	36.5%	52.5%	54.0%	36.0%	40%*
Couple without children	44.4%	20.4%	21.1%	25.0%	27.0%	Middle (€40.000-€100.000)	52.9%	33.4%	29.0%	39.0%	40%*
Single with children	4.1%	9.5%	5.7%	7.2%	6.9%	High (>€100.000)	10.6%	14.1%	16.0%	24.7%	20%*
Couple with children	22.5%	26.4%	19.9%	33.7%	30.3%						
Number of children <12 for households with children						**Car-ownership**					
0 children	53.6%	-	-	-	-	0 cars	22.8%	-	-	-	26.5%
1 child	23.1%	-	-	-	-	1 car	53.6%	-	-	-	47.0%
2 children	17.3%	-	-	-	-	2 cars	19.0%	-	-	-	20.5%
≥3 children	5.3%	-	-	-	-	3 or more cars	4.3%	-	-	-	6.0%

** Income classes for the Netherlands differ in min/max income per group from the classes for the sample. The middle income for NL is €44,100-€106,400*

5. Results

5.1 Descriptive statistics

Approximately 4,200 flyers were distributed, which resulted in an estimated 200 responses (based on the responses in the first week, when the survey was not yet distributed via social media). In total, 318 persons submitted a response. 211 of those were usable because they were complete and/or the persons belonged to the target group.

Table 3 gives a brief overview of the descriptive statistics of the sample. Compared to the population of Rotterdam, Delft and Amersfoort, respondents were relatively old; especially the group of 55-64 years was overrepresented while the group of 27-39 years was underrepresented.

Regarding the household composition were couples without children strongly overrepresented, while singles without children were underrepresented. Respondents were mainly high-educated (60%), although also low and middle-educated persons submitted a response. This is also reflected in the income of respondents: the middle-income group is overrepresented, while the low, but also high, income groups are underrepresented. Car-ownership amongst respondents is similar to the Netherlands, but car-usage is much lower. Many respondents do not prefer to travel by car, which makes this sample different from the population in general.

5.2 Model estimation

First, multiple MNL-models were estimated, each including interactions with a group of characteristics. Table 2 gives an overview of the statistic values of the estimated models. The model with interactions with socio-demographics gave the best results: it had the smallest loglikelihood and largest adjusted rho squared. Therefore, the interaction with socio-demographics which were at least significant with one of the attribute levels were included in the error component ML-model. Multiple models were estimated, with an increasing number of draws until stability was reached, which was at 500 Halton draws. The used utility function is given on the next page.

$$V_i = C + (\beta_{AC_0} + \beta_{I,CA-CB12,0} + \beta_{I,CA-CO,0}) * CA_{i,0}$$
$$+(\beta_{AC_1} + \beta_{I,CA-CB12,1} + \beta_{I,CA-CO,1}) * CA_{i,1}$$
$$+(\beta_{WTtP_0} + \beta_{I,WTtP-CB12_0} + \beta_{I,WTtP-CO_0}) * WTtP_{i,0}$$
$$+ (\beta_{WTtP_1}$$
$$+\beta_{I,WTtP-CB12_1} + \beta_{I,WTtP-CO_1}) * WTtP_{i,1}$$
$$+(\beta_{PT_0} + \beta_{I,PT-Yng_0} + \beta_{I,PT-Edu_0}) * PT_{i,0}$$
$$+(\beta_{PT_1} + \beta_{I,PT-Yng_1} + \beta_{I,PT-Edu_1}) * PT_{i,1}$$
$$+\beta_{SV_0} * SV_0 + \beta_{SV_1} * SV_1$$
$$+\beta_{WTtPTSV_{i,0}} * WTtPTSV_0 + \beta_{WTtPTSV_1} * WTtPTSV_{i,1}$$
$$+\beta_{AM_0} * AM_{i,0} + \beta_{AM_1} * AM_{i,1}$$
$$+\beta_{GR_0} * GR_{i,0} + \beta_{GR_1} * GR_{i,1}$$
$$+(\beta_{AMiPS_0} + \beta_{I,AMiPS-Old_0} + \beta_{I,AMiPS-CB12_0}) * AMiPS_{i,0}$$
$$+(\beta_{AMiPS_1} + \beta_{I,AMiPS-Old_1} + \beta_{I,AMiPS-CB12_1})$$
$$* AMiPS_{i,1} \quad (10)$$

$$i \in alt1, alt2$$

$opt\ out$

Attributes were coded as follows:

9. CA = Car access to streets
10. WTtP = walking time to parking
11. PT = available public transport
12. SV = available shared vehicles
13. WTtPTSV = walking time to public transport and shared vehicles
14. AM = amenities within walking distance
15. GR = type of green
16. AMiPS = amenities in public space

Interactions were coded as follows:

- I,xx-CB12: interaction between xx and a household with children below 12 years old.
- I,xx-CO: interaction between xx and a household which owns at least one car.
- I,xx-Yng: interaction between xx and persons younger than 40 years.
- I,xx-Edu: interaction between xx and highly educated persons

The estimated betas are given on the following pages in tables 5 and 6. Not all estimated betas are significant. Nonetheless, they are being interpreted as they are the best estimate. The next section elaborates on the estimates.

Table 8, Statistics of the estimated models

Statistics	Value
Number of parameters	34
Final loglikelihood	-1677
$\bar{\rho}^2$	0.18
AIC	3422
BIC	3610.69

5.3 Model interpretation

The estimated parameters range, in absolute values, between 0.06 and 2.06. The standard deviation of the constant reveals a lot of unexplained heterogeneity, as this has an absolute value of 1.99.

The car has a lot of influence on the utility of a neighbourhood, especially the walking time to parking. This is in line with Kirschner and Langendorf (2020). When accounting for the interactions, the strongest taste parameter is the beta for less than 1 minute walking to the parked car in case of households with a car and with children. A short walking time is important to all households with a car, but especially for households with young children, which is likely as this reduces the need to walk for several minutes with young children. It is remarkable that also households without a car prefer a short walking time, although their preferences are less strong. Access for cars is also important, but not as important as the walking time. All household types have a preference for streets where cars have access, but preferences differ regarding the speed of cars. Households without a car prefer a speed of 30 km/h, whereas those with a car prefer a low speed of 5 km/h. This is not logical, since it seems more likely that car-owners prefer a higher speed.

Public transport is especially important to young highly educated persons. Most households, except low/middle educated households where adults are over 40, prefer a neighbourhood with access to the train. If no train is available, younger households prefer having only a bus, and older (40+) households prefer neighbourhoods which are served by a bus and tram. This difference could not be explained. The preference for a train is logical, since a train can be used for longer distances, and benefits from the rail bonus (Axhausen et al., 2001; Scherer, 2010), even though that would also apply to the tram. Buses and trams are usually primarily suitable for trips within the city itself. Shared vehicles have less influence on the utility than public transport, although the presence of shared vehicles is valued. This lower influence could be because persons who live without a car know how to do so, and therefore not need a shared car (Baehler and Rérat, 2020). A short walking time to public transport and shared vehicles is also preferred, although it makes little difference whether this is four minutes or less.

them in the neighbourhood, but not necessarily as close as other amenities; whereas all amenities in the attribute levels were as close. Nonetheless, the effect of amenities is relatively small. Also, the effect of green is relatively small, but a clear preference for neighbourhoods with one or more parks is revealed. Whether this is one large park or multiple small parks makes little difference, although a large park is slightly preferred. This could be because large parks

Table 9, Estimated betas for the attribute levels

Parameter	Attribute level	Parameter value	s.e.	t-stat
C (mean)		0.63	0.23	2.67
C (st.dev.)		-1.99	0.18	-11.16
β_{CA_1}	Access for cars with 30 km/h	0.29	0.19	1.51
β_{CA_2}	Access for cars with 5 km/h	0.21	0.18	1.19
$\beta_{CA_{ref}}$	No access for cars	0	-	-
β_{WTtP_1}	<1 minute walking time to parking	0.33	0.22	1.51
β_{WTtP_2}	4 minutes walking time to parking	0.22	0.20	1.13
$\beta_{WTtP_{ref}}$	8 minutes walking time to parking	0	-	-
β_{PT_1}	Available public transport: Bus	-0.18	0.19	-0.96
β_{PT_2}	Available public transport: Bus and tram	0.03	0.16	0.16
$\beta_{PT_{ref}}$	Available public transport: Bus, tram and train	0	-	-
β_{SV_1}	No available shared vehicles	-0.23**	0.11	-2.02
β_{SV_2}	Available shared vehicles: car	-0.10	0.09	-1.12
$\beta_{SV_{ref}}$	Available shared vehicles: car and electric (transport) bike	0	-	-
$\beta_{WTtPTSV_1}$	<1 minute walking time to public transport and shared vehicles	0.37***	0.09	4.02
$\beta_{WTtPTSV_2}$	4 minute walking time to public transport and shared vehicles	0.33***	0.10	3.15
$\beta_{WTtPTSV_{ref}}$	8 minute walking time to public transport and shared vehicles	0	-	-
β_{AM_1}	Available amenities within 5 minutes walking: supermarket and primary school	-0.41***	0.11	-3.72
β_{AM_2}	Available amenities within 5 minutes walking: supermarket, primary school and (non-) food shops	-0.25***	0.11	-2.35
$\beta_{AM_{ref}}$	Available amenities within 5 minutes walking: supermarket, primary school, (non-) food shops and restaurants	0	-	-
β_{GR_1}	Green in the street and multiple small parks	0.33***	0.09	3.79
β_{GR_2}	Green in the street and one large park	0.39***	0.11	3.66
$\beta_{GR_{ref}}$	Much green in the street but no park	0	-	-
β_{AMiPS_1}	Available amenities in public space: Benches	-0.11	0.12	-0.92
β_{AMiPS_2}	Available amenities in public space: Benches and playgrounds	-0.14	0.12	-1.21
$\beta_{AMiPS_{ref}}$	Available amenities in public space: Benches, playgrounds and outdoor sports facilities	0	-	-

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

Regarding the presence of amenities in the neighbourhood are neighbourhoods with a diverse range of amenities preferred. Nonetheless, the availability of restaurants makes little difference. This could be because respondents prefer to have usually provide more activities than small ones (Giles-Corti et al., 2005; McCormack et al., 2010). This is in line with the estimates for amenities in public space. These make little sense for households without children, or persons below 65; but especially for households with children, the availability of playgrounds and outdoor sports facilities is important. These are also important to elderly, which was a surprise. This could be because a neighbourhood with playgrounds and outdoor sports facilities is associated with a spacious neighbourhood which they prefer, as it is unlikely that these elderly want to use the playgrounds and sports facilities by themselves. It might also be that they account for their grandchildren.

Table 10, Estimated betas for the interactions

Parameter	Attribute level	Parameter value	s.e.	t-stat
$\beta_{I,CA\&HHC\ 1}$	Interaction car access with 30 km/h and households with children	-0.23	0.31	-0.75
$\beta_{I,CA\&HHC\ 2}$	Interaction car access with 5 km/h and households with children	-0.39	0.30	-1.30
$\beta_{I,CA\&CO\ 1}$	Interaction car access with 30 km/h and car-ownership (≥1 car)	0.41	0.22	1.82
$\beta_{I,CA\&CO\ 2}$	Interaction car access with 5 km/h and car-ownership (≥1 car)	0.66***	0.21	3.20
$\beta_{I,WTtP\&HHC\_CB12_1}$	Interaction <1 minute walking time to parking and having a child ≤12 years	0.72*	0.37	1.93
$\beta_{I,WTtP\&HHC\_CB12_2}$	Interaction 4 minutes walking time to parking and having a child ≤12 years	0.56*	0.34	1.66
$\beta_{I,WTtP\&CO_1}$	Interaction <1 minute walking time to parking and car-ownership	1.00***	0.25	3.99
$\beta_{I,WTtP\&CO_2}$	Interaction 4 minutes walking time to parking and car-ownership	0.48***	0.23	2.10
$\beta_{I,PT\&Age\_young_1}$	Interaction available public transport (Bus) and age ≤39 years.	-0.17	0.20	-0.84
$\beta_{I,PT\&Age\_young_2}$	Interaction available public transport (Bus and tram) and age ≤39 years.	-0.57***	0.18	-3.11
$\beta_{I,PT\&Edu_1}$	Interaction available public transport (Bus) and education level (high)	-0.35	0.21	-1.63
$\beta_{I,PT\&Edu_2}$	Interaction available public transport (Bus and tram) and education level (high)	-0.41**	0.18	-2.28
$\beta_{I,AMiPS\&Age\_old_1}$	Interaction amenities in public space (Benches) and age (≥65 years)	-0.14	0.23	-0.61
$\beta_{I,AMiPS\&Age\_oldy_2}$	Interaction amenities in public space (Benches and playgrounds) and age (≥65 years)	-0.26	0.22	-1.21
$\beta_{I,AMiPS\&HHC_1}$	Interaction amenities in public space (Benches) and household composition (with children)	-0.67***	0.22	-3.08
$\beta_{I,AMiPS\&HHC_2}$	Interaction amenities in public space (Benches and playgrounds) and household composition (with children)	-0.32	0.21	-1.56

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

Table 11, Estimated betas for the ML-model including the likelihood to relinquish a car. Levels which contribute most to relinquishing a car are printed in blue.

Parameter	Attribute level	Parameter value	s.e.	t-stat
C (mean)		-6.09	193.63	-0.03
C (st.dev.)		7.31***	1.59	4.60
β_{CA_1}	Access for cars with 30 km/h	-5.15	193.62	-0.03
β_{CA_2}	Access for cars with 5 km/h	0.21	0.34	0.62
$\beta_{CA_{ref}}$	No access for cars	0	-	-
β_{WTtP_1}	<1 minute walking time to parking	0.40	0.44	0.91
β_{WTtP_2}	4 minutes walking time to parking	0.24	0.38	0.63
$\beta_{WTtP_{ref}}$	8 minutes walking time to parking	0	-	-
β_{PT_1}	Available public transport: Bus	-5.56	193.62	-0.03
β_{PT_2}	Available public transport: Bus and tram	-0.91***	0.33	-2.74
$\beta_{PT_{ref}}$	Available public transport: Bus, tram and train	0	-	-
β_{SV_1}	No available shared vehicles	-4.59	193.62	-0.02
β_{SV_2}	Available shared vehicles: car	0.28	0.33	0.84
$\beta_{SV_{ref}}$	Available shared vehicles: car and electric (transport) bike	0	-	-
$\beta_{WTtPTSV_1}$	<1 minute walking time to public transport and shared vehicles	0.93***	0.36	2.60
$\beta_{WTtPTSV_2}$	4 minute walking time to public transport and shared vehicles	-0.36	0.45	-0.80
$\beta_{WTtPTSV_{ref}}$	8 minute walking time to public transport and shared vehicles	0	-	-
β_{AM_1}	Available amenities within 5 minutes walking: supermarket and primary school	-0.26	0.44	-0.60
β_{AM_2}	Available amenities within 5 minutes walking: supermarket, primary school and (non-) food shops	-0.03	0.43	-0.06
$\beta_{AM_{ref}}$	Available amenities within 5 minutes walking: supermarket, primary school, (non-) food shops and restaurants	0	-	-
β_{GR_1}	Green in the street and multiple small parks	0.69**	0.34	2.01
β_{GR_2}	Green in the street and one large park	0.47	0.43	1.11
$\beta_{GR_{ref}}$	Much green in the street but no park	0	-	-
β_{AMiPS_1}	Available amenities in public space: Benches	-5.53	193.62	-0.03
β_{AMiPS_2}	Available amenities in public space: Benches and playgrounds	-0.47	0.35	-1.35
$\beta_{AMiPS_{ref}}$	Available amenities in public space: Benches, playgrounds and outdoor sport facilities	0	-	-

***** = significantly different from 0 at 99% (t-stat ≥2.326)**
**** = significantly different from 0 at 95% (t-stat ≥1.960)**
*** = significantly different from 0 at 90% (t-stat ≥1.645)**

5.4 Car-reduction

To investigate which characteristics influence the likelihood to relinquish a car, two methods have been used. To estimate the importance of attributes of a neighbourhood, an ML-model was estimated, but now with an opt-out when someone is unlikely to relinquish his car. This reveals that neighbourhoods where cars can be parked close to one's home, which are only being served by a bus and/or do not have any shared vehicles strongly reduce the likelihood of relinquishing a car. Also having no amenities but benches in public space strongly reduces the utility of a neighbourhood, but it is unlikely that this is linked to the likelihood of relinquishing a car. This is more likely to be linked to the attractiveness of the neighbourhood in general. This reveals that good public transport is important, as well as a very short walking time to public transport and shared vehicles. It is logical that in this model having only shared cars is preferred over shared cars and electric (transport) bikes, because now, the shared car has to replace the private car. An electric (transport) bike can replace a car to some extent, but not as good as another car which is shared instead of private. Available amenities make little difference, although also here, a diverse range is preferred., but this is not necessarily related to relinquishing a car. This also applies to green and amenities in public space.

For other characteristics, correlations were estimated. The correlation with socio-demographics did not give strong correlations, some significant correlations exist, but these are still small, thus no strong relationship exists between socio-demographics and the likelihood to relinquish a car. However, it was shown that elderly are more likely to relinquish their car than persons beneath the age of 65. Attitudes had in contrast to socio-demographics many significant correlations, which were also logical. This revealed that persons who are car-minded are unwilling to relinquish their car, whereas persons who own a car but to whom it is not important are more likely to relinquish it. The correlation with transport mode preferences gave similar results, those who prefer to travel by car are highly unlikely to relinquish their car, whereas those who own a car but prefer to travel by other modes (train, bus, bike, foot) are likely to relinquish it.

The last correlation was the correlation with the preferred location of the neighbourhood has been estimated. This revealed that people who live further away from the city centre, but still in a city, are more likely to relinquish their car than those who live in the city centre. This is not logical, since the city centre is better connected to public transport and it features more amenities, which makes people living in the city centre logically seen more likely to relinquish their car.

6. Application

The estimates from section 5.2 have been applied to a selection of ten real neighbourhoods. These are recently built or planned to be developed soon. Using the estimated parameters from section 5.2 and simulation, the probability that a household prefers a neighbourhood has been calculated. Table 8 presents the selected neighbourhoods, as well as the average probability of a household, regardless of its characteristics, preferring every neighbourhood. This reveals that most neighbourhoods attract a similar percentage of households, but that IJburg attracts much more, whereas the GWL-terrain attracts much fewer households. In general, car-included neighbourhoods seem to attract more households, even though one cannot sum these estimates to tell which percentage would like to live in a car-reduced neighbourhood.

IJburg is popular because of its good accessibility by car (cars have full access and can be parked close to one's home), as well as public transport (both a bus and tram are available). Next to that, many amenities are available in the neighbourhood as well as playgrounds and outdoor sports facilities. The only difference with Ypenburg, scoring second, is the availability of amenities. This reveals that amenities, even though their taste parameter is relatively small, still have much influence. IJburg and Ypenburg are popular amongst all household types, but especially amongst households with children (regardless of age) and a car.

Table 12, Average percentage of households willing to live in every neighbourhood

Neighbourhood	City	Percentage
Car-reduced		
Merwedekanaalzone	Utrecht	9.3%
Sluisbuurt	Amsterdam	8.4%
Schieoevers-North	Delft	8.3%
Merwe-Vierhavens	Rotterdam	9.3%
GWL-terrain	Amsterdam	4.0%
Car-included		
Nesselande	Rotterdam	8.5%
Leidsche Rijn	Utrecht	8.5%
IJburg	Amsterdam	17.8%
Look-West	Den Hoorn	7.5%
Ypenburg	Den Haag	11.8%
Not willing to move		6.7%

The average percentages for the car-reduced neighbourhoods are similar, except for the GWL-terrain, but these vary more between popularity amongst household types. The Mewedekanaalzone deviates between 5.4% and 15.5%, whereas Merwevierhavens variances between 7.0% and 12.1%. Households with children, young parents and without a car have the largest preference for the Merwedekanaalzone. In case of older parents, above 40 but still below 65, the Merwedekanaalzone remains preferred, but to a lower extent than for younger parents. However, Merwe-Vierhavens is more often preferred amongst this group of older parents. This difference is again caused by the tram. The car-reduced neighbourhood which is able to attract most households of a single type is Schieoevers-North, which primarily attracts households without children. Especially young high-educated households prefer this neighbourhood. The main cause for this is the availability of a train, which is only available in this neighbourhood. Another remarkable aspect of Schieoevers-North is its capability to attract households with a car. It does not attract as many households with a car as popular car-included neighbourhoods, but among the car-reduced neighbourhoods, it attracts most. An explanation for this is that cars still have access to the neighbourhood, although with a low speed, but that the neighbourhood is also well accessible by public transport. As a result of this, Schieoevers-North could be the type of car-reduced neighbourhood which could contribute most to a reduction in car-ownership, from this selection of car-reduced neighbourhoods which are described according to the attribute levels of this study. Schieoevers-North could even become much more attractive when more amenities in public space were present. In this application, the most restrained level has been chosen, as plans for this neighbourhood are unclear regarding available possibilities to sport and play. The addition of playgrounds and/or sports facilities would make the neighbourhood also attractive amongst households with children. On average, 12.5% of the households would prefer Schieoevers-North when adding playgrounds and outdoor sports facilities, compared to 8.3% without them. IJburg and Ypenburg drop in this case with respectively 1.0% and 0.7%.

The least popular neighbourhood is the GWL-terrain. This is caused by multiple factors: it is not accessible for cars and it does not feature outdoor sports facilities. Also, no train is available although this applies to almost all selected neighbourhoods. This does not mean that a neighbourhood like the GWL-terrain cannot be a success, but it might not be a success for the general public, but just for certain groups.

In general, this application reveals again that attracting people to car-reduced neighbourhoods is a challenge, due to the focus on cars. Nonetheless, it also reveals that a car-reduced neighbourhood can compete for certain types of households. If these households move to a car-reduced neighbourhood and thereby do not buy a car later on, the neighbourhood still leads to a reduction in cars because fewer new cars are bought. Nonetheless, the effect would be much larger if car-owners were seduced to reside in a car-reduced neighbourhood and relinquish their car. However, Schieoevers-North has shown that this is possible, even though this neighbourhood is not as preferred as some car-included neighbourhoods for car-owners.

7. Discussion

This study gave more insight into the importance of different characteristics of car-reduced neighbourhoods to potential residents. It accounted for differences in socio-demographics. Nonetheless, some socio-demographic groups were overrepresented: especially high-educated persons and persons between 55 and 64 years. This might have some influence on the results, but the effect is expected to be limited. Another difference between the sample and the real population is the orientation regarding travel preferences. compared to the Netherlands Mobility Panel Hoogendoorn-Lanser and De Haas, 2019), only a few respondents prefer to use their car for commuting, doing groceries and other trips. This can be explained by the selection of respondents; those who were too car-minded, and thereby highly unlikely to relocate to a car-reduced neighbourhood, were excluded. Nonetheless, differences remain large. As a result of this, this study might underestimate the importance of cars to people.

The mixed logit model revealed that the car, and especially walking time to the car, was very important to the respondents. As the sample was less car-oriented than people in general, the car-related attributes are likely to be even more important for people in general. This reveals that the car is embedded in society. Even persons who do not prefer to use it attach much value to accessibility by car, which is in line with Selzer (2021). Findings regarding public transport and shared vehicles were largely in line with literature (Baehler and Rérat, 2020). However, a surprising outcome was the value of a tram: young adults, below the age of 40, prefer having a bus over the combination of a bus and a tram. The combination of a bus and tram was expected to be preferred, since this is likely to connect the neighbourhood with more destinations. Next to that, people generally prefer a tram when choosing between a tram and bus, the so-called rail bonus (Axhausen et al., 2001; Scherer, 2010; Bunschoten et al., 2013). However, Ben-Akiva and Morikawa (2002) did not find this rail bonus in their study. They also stated that if the metro is slow, and the bus is of high quality, people prefer the bus. A possible explanation of the value of a tram for young adults could be their associations with a tram and/or bus. Another surprising finding, which is most likely also caused by associations, is the preference of elderly for neighbourhoods featuring outdoor sports facilities. This is however insignificant and could be caused by an association with spaciousness if outdoor sports facilities are present.

The revealed low likelihood of relinquishing a car is in line with literature. Selzer shows that only a few residents relinquished a car, after relocating to a car-reduced neighbourhood. Melia (2014) gives different estimates, between 10% and 62%. Claasen (2020) found a possible reduction of 15% as a result of shared vehicles. Public transport is key when relinquishing a car, which was again revealed in this study, but also by Leibling (2014) and Selzer (2021). To increase the reduction in car-ownership, more measures, which could not be included in the choice-experiment, are required. Gundlach et al. (2018) found for example that the percentage of persons willing to accept car-free policies increases when public transport becomes free of charge.

8. Conclusion

Many cities are planning to reduce the presence and use of cars, due to their negative sides: emissions, noise, reduced health and space consumption. Next to this, cities have to develop many houses. The realisation of car-reduced neighbourhoods contributes to a reduction in car-usage and ownership, and creates liveable residential areas. These neighbourhoods are characterised by:

1) Measures which reduce access for cars
2) The availability of public transport and shared vehicles,
3) Amenities in the neighbourhood itself to stimulate active modes
4) Public space of high quality with much green

This study aimed to reveal the preferences of potential residents of car-reduced neighbourhoods, to be able to create neighbourhoods which attract many residents and thereby reduce car-usage and car-ownership. This was studied using a discrete choice experiment analysed via a mixed logit model.

Even though respondents were less car-oriented than residents of Dutch cities in general, the car remained important. The walking time to the car is most important, especially for households with a car and(/or) young children. A short walking time is more important than having access, although having access to the street is also valued but speed does not matter much in case of access. The public transport offer is important as well, especially neighbourhoods close to a train station are preferred. The availability of shared vehicles, preferably both cars and electric (transport) bikes, is valued, but not as much as public transport. Short walking times to public transport and shared vehicles are preferred, although it makes little difference whether this is 4 minutes walking or less. Neighbourhoods featuring a diverse range of amenities and a park are preferred, over those with little amenities and much green but no park. Lastly, for households with children, the presence of playgrounds and outdoor sports facilities is very important.

The effect of different characteristics on the likelihood to relinquish a car was studied as well. When it comes to neighbourhood characteristics, alternatives for the car must be present. This includes a good public transport offer, preferably including a train, and shared vehicles. Older persons and those with a higher income seem to be slightly more likely to relinquish their car, but correlations between socio-demographics and the likelihood to relinquish a car were low. Correlations with attitudes were stronger. Car-oriented persons were much less likely to relinquish their car than those who own a car, but attach little value to it. The same applies to usage of the car: persons who prefer to use it for regular trips are less likely to relinquish it than those who prefer other modes. Lastly, the correlation between the likelihood of relinquishing a car and the preferred location to live revealed that the higher the rate of urbanity, the larger the likelihood of relinquishing a car. This is promising for car-reduced neighbourhoods, as those are usually highly urban neighbourhoods, thus they are likely to attract those persons who are most likely to relinquish their car.

Lastly, results were applied to real neighbourhoods. This revealed that well-accessible neighbourhoods are most attractive. Car-included neighbourhoods seem to be preferred over car-reduced ones. However, when providing some, but limited, access to cars in a car-reduced neighbourhood, in combination with very good access by public transport, car-owners might want to relocate to a car-reduced neighbourhood, which allows these neighbourhoods to do what they are realised for: reduce car-usage and car-ownership.

9. Recommendations

When developing a car-reduced neighbourhood, the following is recommended:

1) A neighbourhood which provides some access to cars is more likely to attract car-owners than a car-free neighbourhood, and is, therefore, more likely to reduce car-usage and car-ownership.
2) Car-reduced neighbourhoods must be well accessible by high-quality public transport, which can easily be reached. Especially locations close to a train station can attract residents.
3) People prefer neighbourhoods with a park. Households with children especially value neighbourhoods which stimulate activities, which have playgrounds and outdoor sports facilities.

For further research, the following is recommended:

1) Perform a similar study, but amongst a larger sample with people from all socio-demographic classes. This study included people from all socio-demographic classes, but some classes were strongly underrepresented. A possibility is to do this in cooperation with a municipality since results are useful for municipalities and municipalities have the possibility to distribute the survey among many households. To do this, the study should be done in cooperation with the municipality, otherwise, municipalities tend to be reluctant.
2) Evaluate the opinions of residents of large car-reduced neighbourhoods which are being realised at the moment. This can give even more insight into why they choose to relocate to a car-reduced neighbourhood and what they (do not) value about those neighbourhoods.

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References

Amrheim, V., Greenland, S. and McShane, B. (2019). Retire statistical significance. *Nature, 567*, 305-307. https://doi.org/10.1038/d41586-019-00857-9.

Axhausen, K.W., haupt, T., Fell, B. and Heidl, U. (2001). Searching for the Rail Bonus. Results from a panel SP/RP study. *European Journal of Transport and Infrastructure Research, 1 (4),* 353-369. https://doi.org/10.3929/ethz-a-006098486.

Baehler, D. and Rérat, P. (2020). Beyond the car. Car-free housing as a laboratory to overcome the "system of automobility". *Applied Mobilities*. https://doi.org/10.1080/23800127.2020.1860513.

Bahrampour, M., Byrnes, J., Norman, R., Scuffham, P.A. and Downes, M. (2020). Discrete choice experiments to generate utility values for multi-attribute utility instruments: a systematic review of methods. *The European Journal of Health Economics, 21*, 983-992. https://doi.org/10.1007/s10198-020-01189-6.

Bohnet, M. (2007). Influence of land use and transportation system on car ownership.

Boxall and Adamowicz (2002). Understanding Heterogeneous Preferences in Random Utility Models: A Latent Class Approach. *Environmental and Resource Economics, 23,* 421-446. https://doi.org/10.1023/A:1021351721619.

Buehler, R., Pucher, J., Gerike, R. and Götschi, T. (2016). Reducing car dependence in the heart of Europe: lessons from Germany, Austria, and Switzerland. *Transport Reviews, 37 (1),* 4-28. https://doi.org/10.1080/01441647.2016.1177799.

Bunschoten, T., Molin, E. and Van Nes, R. (2013). Tram or bus, does the tram bonus exist? *European Transport Conference 2013*. http://resolver.tudelft.nl/uuid:f248f7c8-c01c-4f9e-832e-9a884c76c409.

Cao, X., Mokhtarian, P. L., & Handy, S. L. (2007). Do changes in neighborhood characteristics lead to changes in travel behavior? A structural equations modeling approach. *Transportation, 34(5),* 535– 556. https://doi.org/10.1007/s11116-007-9132-x.

CBS (2019a). *Meer dan 200 maal zoveel personenauto's als in 1927.* https://www.cbs.nl/nl-nl/nieuws/2019/51/meer-dan-200-maal-zo-veel-personenauto-s-als-in-1927.

CBS (2019b). Nabijheid voorzieningen; afstand locatie, wijk- en buurtcijfers 2019. Retrieved from: https://opendata.cbs.nl/#/CBS/nl/dataset/84718NED/table.

CBS (2021a). Huishoudens; samenstelling, grootte, regio, 1 januari. Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/71486NED/table?fromstatweb.

CBS (2021b). Bevolking; onderwijsniveau en –richting 2003-2021. Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82816ned/table?dl=8083.

CBS (2022a). Bevolking op 1 januari en gemiddeld; geslacht, leeftijd en regio. Retrieved from: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/03759ned/table?fromstatweb.

CBS (2022b). Autobezit per huishouden, januari 2020. Retrieved from: https://www.cbs.nl/nl-nl/maatwerk/2022/12/autobezit-per-huishouden-januari-2020.

Centraal Planbureau and KiM Netherlands Institute for Transport Policy Analysis (2009). *Het belang van openbaar vervoer. De maatschappelijke effecten op een rij.* Den Haag. https://www.cpb.nl/sites/default/files/publicaties/download/het-belang-van-openbaar-vervoer-de-maatschappelijke-effecten-op-een-rij.pdf

ChoiceMetrics (2018). Ngene 1.2, User Manual and Reference Guide. http://www.choice-metrics.com/NgeneManual120.pdf.

Chorus, C. (2020a). *Discrete choice modeling and the Logit-model. SEN1221, part I, lecture 1.*

Chorus, C. (2020b). *Mixed Logit. SEN1221, part I, lecture 2.*

Christiadi and Cushing, B. (2007). Conditional Logit, IIA, and Alternatives for Estimating Models of Interstate Migration. *Regional Research Institute Working Papers, 65*. https://researchrepository.wvu.edu/rri_pubs/65.

Christiansen, P., Engebretsen, Ø., Fearnley, N. and Hanssen, J.U. (2017a). Parking facilities and the built environment: Impacts on travel behaviour. *Transportation research part A: Policy and Practice, 95*, 198-206. https://doi.org/10.1016/j.tra.2016.10.025.

Christiansen P., Fearnley, N., Hanssen J.U. and Skollerund, K. (2017b). Household parking facilities: relationship to travel behaviour and car ownership. Transport research Procedia, 25, 4185-4195. https://doi.org/10.1016/j.trpro.2017.05.366.

Claasen, Y. (2020). *Potential effects of mobility hubs. Intention to use shared modes and the intention to reduce household car ownership*

Clark, B., Chatterjee, K. and Melia, S. (2016). Changes to commute mode: The role of life events, spatial context and environmental attitude. *Transportation Research part A, 89*, 89-105. http://dx.doi.org/10.1016/j.tra.2016.05.005.

Crawford, J.H. (2002). *Carfree cities*. International Books

CROW (2021) *ASVV*. CROW publication 740.

CROW (n.d.). Voetganger. Welke afstand is men bereid te lopen? Retrieved from: https://www.crow.nl/duurzame-mobiliteit/home/systeemintegratie/voetganger/loopafstanden-in-cijfers#:~:text=Volgens%20de%20ASVV%20(CROW%202004,of%20naar%20haltes%20en%20stations

De Nazelle, A., Nieuwenhuijsen, M.J., Antó, J.M., brauer, M., Briggs, D., Braun-Fahrlander, C., Cavill, N., Cooper, A.R., Desqueyroux, H., Fruin, S., Hoek, G., Panis, L.I., Janssen, N., Jerrett, M., Joffe, M., Jovanovic Andersen, Z., Van Kempen, E., Kingham, S., Kubesch, N., … , Lebret, E. (2011). Improving health through policies that promote active travel: A review of evidence to support integrated health impact assessment. *Environment International, 37 (2011),* 766-777. http://dx.doi.org/10.1016/j.envint.2011.02.003.

De Nies, C.A. (2020). *Car owners' willingness to reside in a car restricted residential area*.

De Vos, J., Derudder, B., Van Acker, V. and Witlox, F, (2012). Reducing car use: changing attitudes or relocating? The influence of residential dissonance on travel behavior. *Journal of Transport Geography, 22*, 1-9. https://doi.org/10.1016/j.jtrangeo.2011.11.005.

De Vos, J. and Alemi, F. (2020). Are young adults car-loving urbanites? Comparing young and older adults' residential location choice, travel behavior and attitudes. *Transportation research part A: Policy and Practice, 132*, 986-998. https://doi.org/10.1016/j.tra.2020.01.004.

De Vos, J., Mouratidis, K., Cheng, L., Kamruzzaman, Md. (2021). Does a residential relocation enable satisfying travel? *Transportation Research part A, 153*, 288-201. https://doi.org/10.1016/j.tra.2021.09.006.

Ellder, E. (2020). What Kind of Compact Development Makes People Drive Less? The "Ds of the Built Environment" versus Neighborhood Amenities. *Journal of Planning Education and Research, 40*, 432-446. https://doi.org/10.1177%2F0739456X18774120.

Ellder, E., Haugen, K. and Vilhelmson, B. (2022). When local access matters: A detailed analysis of place, neighbourhood amenities and travel choice. *Urban Studies, 59*, 120-139. https://doi.org/10.1177%2F0042098020951001.

Erlwein, S. and Pauleit, S. (2021). Trade-Offs between Urban Green Space and Densification: Balancing Outdoor Thermal Comfort, Mobility, and Housing Demand. *Urban Planning, 6 (1),* 5-19. https://doi.org/10.17645/up.v6i1.3481.

Fiebig, D.G., Keane, M.P., Louviere, J. and Wasi, N. (2010). The Generalized Multinomial Logit Model:Accounting for Scale and Coefficient Heterogeneity. *Marketing Science, 29 (3)*, 393-421. https://doi.org/10.1287/mksc.1090.0508.

Giles-Corti, B.; Broomhall, M.H., Knuiman, M., Collins, C., Douglas, K., Ng, K., Lange, A. and Donovan, R.J. (2005). Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine, 28 (2),* 169-176. https://doi.org/10.1016/j.amepre.2004.10.018.

Glazener, A. and Khreis, H. (2020). Chapter 16 - Best practices for air quality and active transportation. *Traffic-Related Air Pollution,* 405-435. https://doi.org/10.1016/B978-0-12-818122-5.00016-8.

Gössling, S. (2020). Why cities need to take road space from cars – and how this could be done. *Journal of Urban Design, 25 (4),* 443-448. https://doi.org/10.1080/13574809.2020.1727318.

Greene, W.H. and Hensher, D.A. (2003). A latent class model for discrete choice analysis: contrasts with mixed logit. *Transportation Research part B, 37,* 681-698. https://doi.org/10.1016/S0191-2615(02)00046-2.

Greene, W.H. and Hensher, D.A. (2007). Heteroscedastic control for random coefficients and error components in mixed logit. *Transportation Research Part E: Logistics and Transportation Review, 43 (5),* 610-623. https://doi.org/10.1016/j.tre.2006.02.001.

Guan, X., Wang, D. and Cao, X.J. (2019). The role of residential self-selection in land use-travel research: a review of recent findings. *Transport revieuws, 40(3),* 267-287. https://doi.org/10.1080/01441647.2019.1692965.

Gunawardena, K.R., Wells, M.J. and Kershaw, T. (2017). Utilising green and bluespace to mitigate urban heat island intensity. *Science of the Total Environment, 584-585,* 1040-1055. https://doi.org/10.1016/j.scitotenv.2017.01.158.

Gundlach, A., Ehrlinspiel, M., Kirsch, S., Koschker, A. and Sagebiel, J. (2018). Investigating people's preferences for car-free city centers: A discrete choice experiment. *Transportation research part D: Transport and Environment, Volume 63.* 677-688. https://doi.org/10.1016/j.trd.2018.07.004.

Guo, Y. and Peeta, S. (2020). Impacts of personalized accessibility information on residential location choice and travel behavior. *Travel Behaviour and Society, 19,* 99-111. https://doi.org/10.1016/j.tbs.2019.12.007.

Guo, J., Feng, T. and Timmermans, H.J.P. (2020). Modeling co-dependent choice of workplace, residence and commuting mode using an error component mixed logit model. *Transportation, 47,* 911-933. https://doi.org/10.1007/s11116-018-9927-y.

GWL-terrein (n.d.). *Factsheet 2: Ontstaan en bouw van de milieuwijk*. Retrieved from: https://gwl-terrein.nl/wp-content/uploads/2017/05/factsheet-2-onstaan-final.pdf.

Handy, S. (2017). Thoughts on the meaning of Mark Stevens's Meta-Analysis. *Journal of the American Planning Association, 83 (1),* 26-28. https://doi.org/10.1080/01944363.2016.1246379.

Hauke, J. and Kosswski, T. (2011). Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data. *Quaestiones Geographicae, 30 (2).*

HEI (2010). *Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. A Special Report of the HEI Panel on the Health Effects of Traffic-Related Air Pollution*. Boston. https://www.healtheffects.org/system/files/SR17TrafficReview_Exec_Summary.pdf.

Hensher D.A. and Greene, W.H. (2003). The Mixed Logit model: The state of practice. *Transportation, 30,* 133-176. https://doi.org/10.1023/A:1022558715350.

Hess, S., Ben-Akiva, M., Gopinath, D. and Walker, J. (2011). Advantages of latent class over continuous mixture of Logit models.

Hoogendoorn-Lanser, S., N. Schaap & M.-J. Olde Kalter (2015). The Netherlands Mobility Panel: An innovative design approach for web-based longitudinal travel data collection. *10th International Conference on Transport Survey Methods, Transportation Research Procedia 11 (2015)*, 311-329. https://doi.org/10.1016/j.trpro.2015.12.027.

Hoogendoorn-Lanser, S. and de Haas, M. (2019). *MPN 2019.* KiM Netherlands Institute for Transport Policy Analysis. Hurtubia, R., Mora, R. and Moreno, F. (2021). The role of bike sharing stations in the perception of public spaces: A stated preferences analysis. *Landscape and Urban Planning*, 214. *https://doi.org/10.1016/j.landurbplan.2021.104174.*

Kabeldistrict (n.d.). Plan. Retrieved from: https://kabeldistrict.nl/plan/.

Khreis, H., May, A.D. and Nieuwenhuijsen, M.J. (2017). Health impacts of urban transport policy measures: A guidance note for practice. *Journal of Transport & Health, 6,* 209-227. https://doi.org/10.1016/j.jth.2017.06.003.

KiM Netherlands Institute for Transport Policy Analysis, KiM (2021). *Mobiliteitsbeeld 2021. Bekroonde mobiliteit* (KiM-21-A018). https://www.kimnet.nl/publicaties/publicaties/2021/11/18/mobiliteitsbeeld-2021.

KiM Netherlands Institute for Transport Policy Analysis (2022a) *Verklaringen voor de verschillen in autobezit bij Nederlandse huishoudens*. Den Haag.

KiM Netherlands Institute for Transport Policy Analysis. (2022b) *De maatschappelijke effecten van het wijdverbreide autobezit in Nederland*. Den Haag.

Kim, H.C., Nicholson, A. and Kusumastuti, D. (2017). Analysing freight shippers mode choice preference heterogeneity using latent class modelling. *Transportation Research Procedia, 25,* 1109-1125. https://doi.org/10.1016/j.trpro.2017.05.123.

Kirschner F. and Lanzendorf, M. (2019) Parking management for promoting sustainable transport in urban neighbourhoods. A review of existing policies and challenges from a German perspective. *Transport Reviews, 40,* p54-75. https://doi.org/10.1080/01441647.2019.1666929.

Kirschner F. and Lanzendorf, M. (2020). Support for innovative on-street parking policies: empirical evidence from an urban neighborhood. *Journal of Transport Geography, 85,* 102726. https://doi.org/10.1016/j.jtrangeo.2020.102726.

Kroesen, M., and van Wee, G. P. (2021). *Autobezit en autogebruik onder jongeren en visies ten aanzien van deelmobiliteit*. Delft University of Technology.

Lee, A.C.K. and Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health, 33 (2),* 212-222. https://doi.org/10.1093/pubmed/fdq068.

Leibling, D. (2014). Parking supply and demand in London. *Transport and Sustainability, 5*, 259-289. https://doi.org/10.1108/S2044-994120140000005013.

Likas, A., Vlassis, N. and Verbeek, J.J. (2003). The global k-means clustering algorithm. *Pattern Recognition, 36 (2),* 451-461. https://doi.org/10.1016/S0031-3203(02)00060-2.

Lincoln-siedlung (n.d.). *E-Carpooling: "mein Lincoln mobil".* Retrieved from : https://www.lincoln-siedlung.de/mobilitaet/lincoln-mobil.

Lower, A. and Szumilas, A. (2021). Parking Policy as a Tool of Sustainable Mobility-Parking: Standards in Poland vs. European Experiences. *Sustainability, 13,* 11330. https://doi.org/10.3390/su132011330.

Marcheschi, E., Vogel, N., Larsson, A., Perander, S. and Koglin, T. (2022). Residents' acceptance towards car-free street experiments: Focus on perceived quality of life and neighborhood attachment. *Transportation Research Interdisciplinary Perspectives, 14,* 100585. https://doi.org/10.1016/j.trip.2022.100585.

McCormack, G.R., Rock, M., Toohey, A.M. and Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place, 16 (4),* 712-726. https://doi.org/10.1016/j.healthplace.2010.03.003.

McFadden, D. (1981). Econometric models of probabilistic choice. *Structural Analysis of Discrete Data, Cambridge: MIT Press*, 198-272.

McFadden, D. and Train, K. (2000). Mixed MNL models for discrete response. *Journal of Applied Econometrics, 15 (5),* 447-470. https://doi.org/10.1002/1099-1255(200009/10)15:5%3C447::AID-JAE570%3E3.0.CO;2-1.

Melia, S., Barton, H. and Parkhurst, G. (2012). Potential for carfree developments in the UK. *Urban Design and Planning, 166,* 136-145. http://dx.doi.org/10.1680/udap.10.00048.

Melia, S. (2014). Carfree and Low-Car Development. Parking Issues and Policies. *Transport and Sustainability, 5*, 213-233. https://doi.org/10.1108/S2044-994120140000005012.

Midden Delfland (2002). *Look-West: Verkoop eerste fase binnenkort van start.* Retrieved from: http://jaar2002.middendelfland.net/denhoorn/lookwest1.htm.

Ministry of the Interior and Kingdom Relations (2020). *Nationale Omgevingsvisie. Duurzaam perspectief voor onze leefomgeving*.
Mocktarian, P.L. and Cao, X. (2008). Examining the impacts of residential self-selection on travel behavior: A focus on methodologies. *Transportation Research part B, 42,* 204-228. https://doi.org/10.1016/j.trb.2007.07.006.
Mohajerani, A., Bakaric, J. and Jeffrey-Bailey, T. (2017). The urban heat island effect, its causes, and mitigation, with reference to the thermal properties of asphalt concrete. *Journal of Environmental Management, 197,* 522-538. https://doi.org/10.1016/j.jenvman.2017.03.095.
Molin (2017). *The use of basic plans for constructing profiles (alternatives)*
Molin (2021). *Constructing choice sets: Orthogonal designs. Lecture 2, SEN1221, part II*.
Molin, E.J.E. and Maat, C. (2015). Bicycle parking demand at railway stations: Capturing price-walking trade offs. *Research in Transport Economics, 53,* 3-12. http://dx.doi.org/10.1016/j.retrec.2015.10.014.
Molin, E., Oppewal, H. and Timmermans, H. (1996). Predicting consumer response to new housing: A discrete choice experiment. *Netherlands journal of housing and the built environment, 11,* 297-311.
Moreno, C. (2021). The 15-minute city. TED. Retrieved from: https://www.ted.com/talks/carlos_moreno_the_15_minute_city?language=en.
Moreno, C., Allam, Z., Chabaud, D., Gall, C. and Pratlong, F. (2021). Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart cities, 4 (1),* 93-111. https://doi.org/10.3390/smartcities4010006.
MRA Platform Smart Mobility (2021). *Leidraad Gebiedsontwikkeling & Smart Mobility. Versie 2.0*. Amsterdam. https://smartmobilitymra.nl/wp-content/uploads/2021/07/MRA-smart-mobility-leidraad-V9.pdf.
Municipality of Amersfoort (2022). Gemeente Amersfoort in cijfers. https://amersfoortincijfers.nl/jive.
Municipality of Amsterdam (2014). *Bestemmingsplan De Houthaven 2013. Bestemmingsplan voor vaststelling. Toelichting*.
Municipality of Amsterdam (2017). *Stedenbouwkundig Plan Sluisbuurt*. Retrieved from: https://www.amsterdamsebinnenstad.nl/archief/sluisbuurt/concept_stedenbouwkundigplan_sluisbuurt.pdf.
Municipality of Amsterdam (2020). *Amsterdam maakt ruimte. Agenda Amsterdam autoluw*. Municipality of Amsterdam, Traffic and Public Space. Municipality of Amsterdam (2022). *Deelvervoer*. Retrieved from: https://kaart.amsterdam.nl/deelvervoer#52.3726/4.8395/52.3900/4.9054/brt/14264,14265,14331//.
Municipality of Amsterdam (n.d.). *IJburg: nieuwe eilanden en woningbouw*. Retrieved from: https://www.amsterdam.nl/projecten/ijburg/.
Municipality of Delft (2021). *Omgevingsvisie Delft 2040. Samen maken we de stad!*
Municipality of Delft and BURA urbanism (2021). Schieoevers Noord Delft. Ruimtelijk kwaliteitskader. BURA urbanism. Amsterdam. https://media.delft.nl/pdf/Schieoevers/Ruimtelijk-kwaliteitskader-Schieoevers-Noord.pdf.
Municipality of Delft and marco.broekman (2019). Schieoevers Noord Delft, Ontwikkelplan. marco.broekman. Amsterdam. https://delft.notubiz.nl/document/8948238/1#search=%22ontwikkelplan-schieoevers-noord%22.
Municipality of Delft (2022). *Delft in cijfers*. https://delft.incijfers.nl/jive.
Municipality of Haarlem (2021). *Omgevingsvisie Haarlem 2045. Toekomstbestendig, vergroenen, verbinden en ontmoeten*. Retrieved from: https://haarlem.nl/sites/default/files/2022-06/Omgevingsvisie%20Haarlem%202045.pdf.
Municipality of Rotterdam (2020). *Rotterdamse Mobilitetsaanpak*. Retrieved from: https://www.rotterdam.nl/wonen-leven/mobiliteitsaanpak/Rotterdamse-Mobiliteitsaanpak1.pdf.
Municipality of Rotterdam (2022). *Onderzoek010*. https://onderzoek010.nl/jive.
Municipality of Utrecht (2020). *Leefbare stad en maatschappelijke voorzieningen. Koersdocument*. Retrieved from: https://omgevingsvisie.utrecht.nl/fileadmin/uploads/documenten/zz-omgevingsvisie/koers/2020-03-koersdocument-leefbare-stad-en-maatschappelijke-voorzieningen.pdf.
Municipality of Utrecht, BPD Ontwikkeling, Janssen de Jong, Greystar, AM, Synchroon, Boelens de gruyter, G&S Vastgoed, Round Hill Capital, Lingotto, 3T Vastgoed, BURA urbanism, OKRA Landschapsarchitecten, MARK RABBIE urban concepts, Stadkwadraat, Goudappel Coffeng, RebelGroup, Merosch, Unchain the Tigers, Impuls and Kassing Notuleerservice (2021). *Stedenbouwkundig Plan Merwede*. BURA urbansim. https://omgevingsvisie.utrecht.nl/fileadmin/uploads/documenten/wonen-en-leven/bouwprojecten-en-stedelijke-ontwikkeling/bouwprojecten/merwedekanaalzone/stadswijk-merwede/2020-11-stedenbouwkundig-plan-merwede.pdf.
Municipality of Zwolle (2021). *Mijn Zwolle van morgen 2030, Omgevingsvisie*. Retrieved from: https://www.zwolle.nl/sites/default/files/bijlage-3-omgevingsvisie-2021-v3.pdf.
Mokhtarian, P.L. and Cao, X. (2008). Examining the impacts of residential self-selection on travel behavior: A focus on methodologies. *Transportation Research part B: Methodological, 42(3).,* p204-228. https://doi.org/10.1016/j.trb.2007.07.006.
Mueller, N., Rojas-Rueda, D., Basagaña, X., Cirach, M., Hunter, T.C., Dadvand, P., Donaire-Gonzalez, D., Foraster, M., Gascon, M., Martinez, D., Tonne, C., Triguero-Mas, M., Valentín, A. and Nieuwenhuijsen, M.J. (2017). Urban and transport planning related exposures and mortality: A health impact assessment for cities. *Environmental Health Perspectives, 125 (1)*. https://doi.org/10.1289/EHP220.
Nieuwenhuijsen, M.J. (2016). Urban and transport planning, environmental exposures and health-new concepts, methods and tools to improve health in cities. *Environmental health, 15 (Suppl. 1, S38)*. https://doi.org/10.1186/s12940-016-0108-1.
Nieuwenhuijsen M. J. and Khreis, H. (2016). Car free cities: pathway to healthy urban living. *Environment International. Volume 94*. 251-262. https://doi.org/10.1016/j.envint.2016.05.032.
Nieuwenhuijsen, M.J. (2020). Urban and transport planning pathways to carbon neutral, liveable and healthy cities; A review of the current evidence. *Environment International, 140,* 105661. https://doi.org/10.1016/j.envint.2020.105661.
Nieuwenhuijsen, M. (2021). New urban models for more sustainable, liveable and healthier cities post covid19; reducing air pollution, noise and heat island effects and increasing green space and physical activity. *Environment International, 157,* 106850. https://doi.org/10.1016/j.envint.2021.106850.
Nordlund, A.M. and Garvill, J. (2003). Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *Journal of Environmental Policy. Volume 23*. 339-347. https://doi.org/10.1016/S0272-4944(03)00037-9.
Puhe, M. and Schippl, J. (2014). User Perceptions and Attitudes on Sustainable Urban Transport among Young Adults: Findings from Copenhagen, Budapest and Karlsruhe. *Journal of Environmental Policy and Planning, 16,* 337-357. https://doi.org/10.1080/1523908X.2014.886503.
Rau, A. (2018). *Transport and the Environment. Topic 1: Transport and air pollution*. Technical University of Munich.
Revelt, D. and Train, K. (1998). Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level. *The Review of Economics and Statistics, 80 (4),* 647-657. https://doi.org/10.1162/003465398557735.
Rose, J.M. and Bliemer, M.C.J. (2009). Constructing Efficient Discrete choice experimental Designs. *Transport Reviews, 29 (5),* 587-617. https://doi.org/10.1080/01441640902827623.
Rotterdam Makers District (2019). *Ruimtelijk Raamwerk Merwe-Vierhavens Rotterdam. Toekomst in de maak*. Retrieved from: https://m4hrotterdam.nl/wp-content/uploads/2019/07/DLA-M4H-17028-Boekwerk-190627-LQ.pdf.
Rotterdam Makers District (2022). *Mobiliteitsstrategie Merwede-*

Vierhavens. https://m4hrotterdam.nl/wp-content/uploads/2022/02/M4H_mobiliteitsstrategie_DEF.pdf.
Scherer, M. (2010). Is light rail more attractive to users than bus transit? Arguments based on cognition and rational choice. *Transportation research record, 2144,* 11-19. https://doi.org/10.3141%2F2144-02.
Selzer, S. (2021). Car-reduced neighborhoods as blueprints for the transition toward an environmentally friendly urban transport s1ystem? A comparison of narratives and mobility-related practices in two case studies. *Journal of Transport Geography, 96,* 103-126. https://doi.org/10.1016/j.jtrangeo.2021.103126.
Selzer S. and Lanzendorf M. (2019) On the road to sustainable urban and transport development in the automobile industry. Traced narratives of car-reduced neighbourhoods. *Sustainability, 11*, 4375. https://doi.org/10.3390/su11164375.
Selzer and Lanzendorf (2022). Car independence in an automobile society? The everyday mobility practices of residents in a car-reduced housing development. *Travel Behaviour and Society, 28,* 90-105. https://doi.org/10.1016/j.tbs.2022.02.008.
Stadtteil-Vauban (n.d.). *Verkehr, Geschichte und Hintergrund der Verkehrskonzept Vauban*. Retrieved from: https://stadtteil-vauban.de/verkehr/.
Stubbs, M. (2002). Car Parking and Residential Development: Sustainability, Design and Planning olicy, and Public Perceptions of Parking Provision. *Journal of Urban Design, 7(2),* 213-237. https://doi.org/10.1080/1357480022000012249.
The Economist Intelligence Unit (2021). *The Global Liveability Index 2021. How the Covid-19 pandemic affected liveability worldwide.*
Train, K. (2000). Halton Sequences for Mixed Logit. *UC Berkeley: Department of Economics*. Retrieved from https://escholarship.org/uc/item/6zs694tp.
Train, K. (2002). Discrete Choice Methods with Simulation.
Van Acker, V., Van Wee, B. and Witlox, F. (2010). When Transport Geography Meets Social Psychology: Toward a Conceptual Model of Travel Behaviour. *Transport Reviews, 30 (2),* 219-240. https://doi.org/10.1080/01441640902943453.
Van de Coevering, P., Maat, K. and Van Wee, B. (2018). Residential self-selection, reverse causality and residential dissonance. A latent class transition model of interactions between the built environment, travel attitudes and travel behavior. *Transportation Research part A, 118,* 466-479. https://doi.org/10.1016/j.tra.2018.08.035.
Van Wee, B., Holwerda, H. and van Baren, R. (2002). Preferences for Modes, Residential Location and Travel Behaviour: the Relevance for Land-Use Impacts on Mobility. *Impacts on Mobility. European Journal of Transport and Infrastructure Research, 2(4),* 305-316. https://doi.org/10.18757/ejtir.2002.2.4.3729.
Van Wee, B. (2009). Self-Selection: A Key to a Better Understanding of Location Choices, Travel Behaviour and Transport Externalities? *Transport Reviews, 29 (3),* 279-292. https://doi.org/10.1080/01441640902752961.
Veldwijk, J., Lambooij, M.S., De Bekker-Grob, E.W., Smit, H.A., and de Wit, G.A. (2014). The Effect of Including an Opt-Out Option in Discrete Choice Experiments. *PLoS ONE, 9 (11).* https://doi.org/10.1371/journal.pone.0111805.
Wang, J., Dane, G.Z. and Timmermans, H.J.P. (2021). Carsharing-facilitating neighbourhood choice: a mixed logit model. *Journal of Housing and the Built Environment, 36,* 1033-1054. https://doi.org/10.1007/s10901-020-09791-z.

B. Interviews

Interviews were held with several persons with a different background than the author. The following persons have been interviewed:

- Dr.Ir. R.M. (Remon) Rooij. Associate Professor at TU Delft, section Spatial planning and Strategy
- Ir. R.J. (Rients) Dijkstra. Associate Professor of Urban Design
- Ir. J. (Joost) de Jong, senior advisor sustainable mobility at Arcadis
  E. (Edvard) Hendriksen, advisor sustainable mobility at Over Morgen
  Resultaten van dit interview zijn nog niet meegenomen in dit rapport
- Ir. E. (Eva) Gaaff, consultant urban development and real estate at Arcadis
- Drs. J.K. (Juul) Buitink, strategic policy advisor regarding transport at Municipality of Dordrecht.
- W.N. (Walter) Prot, senior advisor regarding transport at Municipality of Amersfoort.
- J. (Jasper) Meekes, advisor regarding mobility at Municipality of Nijmegen.

C. Selection of neighbourhoods

This appendix elaborates on the K-means clustering process to select the neighbourhoods, and gives an overview of the clusters for Rotterdam, Delft and Amersfoort. Note that the given averages are the averages of the average values of the neighbourhoods. These given averages are not weighted for the number of persons or households. Applying weights would result in different values, although it is expected that it would have little effect in the cluster process. The given standard deviations reveal to what extent the averages of individual neighbourhoods in a cluster deviate from the average for the cluster to which they belong. Therefore, it does not show to what extent individual households differ.

C.1 K-means cluster proces

Clusters were made using K-means clustering (Likas et al., 2003), with the following steps:

1. Data preparation: Datasets contain all neighbourhoods in a city. However, some of them are business areas, and have a negligible number of inhabitants. Therefore, these neighbourhoods are removed from the dataset.
2. Normalising input values: K-means clustering makes use of dimensions. In this situation, these are the characteristics average age, average household size, average standardised income and average number of cars per household which together form a 4D-space. All dimensions must have the same range of values, to prevent giving different weights to the dimensions. This requires normalisation, to prevent giving a higher weight to characteristics with higher numbers.
3. Determine the number of clusters.
4. Determine coordinates of the clusters: Initially, clusters are placed randomly within the created 4D-space.
5. Determine the Euclidian distance from a neighbourhood to every cluster. The cluster which is closest is selected as the cluster to which that neighbourhood belongs.
6. Determine new coordinates of every cluster: For every dimension, this is the average of the coordinates for all neighbourhoods regarding that dimension.
7. Steps 4 and 5 are repeated until the clusters are stable (neighbourhoods do not switch cluster anymore). It is possible that not all clusters as defined in step 3 contain neighbourhoods.

The next sections elaborate on the clusters and selected neighbourhoods for Rotterdam, Delft and Amersfoort.

C.2 Rotterdam

The municipality of Rotterdam has 93 neighbourhoods. However, 21 of them are business areas with few inhabitants. These are excluded from the process of making clusters. Next to the business areas, some suburbs such as Hoogvliet and Hoek van Holland, are part of the municipality, but located further away from the city itself. These are included in the cluster process, but will not be used for the distribution of the survey.

Ten clusters are created, although some of them do not contain any neighbourhoods. Other clusters contain neighbourhoods with lacking data. Both clusters without neighbourhoods and with neighbourhoods with lacking data are not used to distribute the survey. Reducing the number of clusters mainly enlarged clusters with usable neighbourhoods, whereas empty clusters and clusters with lacking data remained. Increasing the number of clusters mainly lead to more clusters with lacking data.

Table C.1, Clusters in Rotterdam

Cluster		C	F	G	H	I	J
#Neighbourhood		4	11	24	14	2	17
#Inhabitants		36,902	96,140	277,536	172,674	4,208	58,622
Average age	Mean	40.15	36.69	37.59	41.55	38.75	40.23
	Std	*4.31*	*1.46*	*2.43*	*3.26*	*7.64*	*4.52*
Average household size	Mean	2.15	1.59	1.93	2.01	No data	1.88
	Std	*0.38*	*0.13*	*0.13*	*0.12*	-	*0.39*
Average standardised income x1,000	Mean	50.50	28.48	24.74	30.75	No data	No data
	Std	*5.64*	*3.53*	*2.64*	*2.59*	-	-
Average number of cars per household	Mean	0.95	0.45	0.59	0.85	1.35	0.76
	Std	*0.23*	*0.08*	*0.08*	*0.11*	*0.15*	*0.25*

Table C.1 gives an overview of the characteristics of clusters which contain neighbourhoods. This reveals that:

- Cluster C contains household with primarily a relatively high income. Car-ownership is slightly larger than in the other clusters (except for I). The household composition and average age are diverse.
- Cluster F contains small households (more than half of the households is formed by singles) with the lowest rate of car-ownership.
- Cluster G is characterised by households with a low income. Whereas both clusters F and G contain people in their thirties, the household compositions in cluster G
- are more diverse than in F. This is not reflected by the standard deviation, as it represents the standard deviation of the household size, and not of the composition. Data of the household compositions shows that the percentage of singles in cluster G is on average 9 percentage points lower, but the number of families in G is on average 9 percentage points larger.
- Cluster H contains the middle class with an income around €30,000. The average age of this group is highest, with 41.55 years. Car-ownership approaches 1.0. This can be explained by multiple other characteristics. The income of this cluster is larger than the other large clusters F and G, cluster H contains relatively many families and neighbourhoods of this cluster are situated further away from the centre. Four of these are part of suburbs.
- Cluster I contains only two neighbourhoods, which lack data regarding household size and income. One of these neighbourhoods is a rural area close to Rotterdam, the other is a neighbourhood which is similar to those in cluster C regarding household composition, car-ownership and education level, although the average age is lower.

- Cluster J is formed by remaining neighbourhoods with no data regarding the income of households. Neighbourhoods in this cluster are diverse regarding the other characteristics.

No surveys are distributed in clusters I and J, because they lack data, which makes it impossible to determine whether it is useful to distribute the survey in these neighbourhoods.

Table C.2 gives the list of neighbourhoods where the survey is distributed. Cluster C is relatively small regarding the number of inhabitants, thus only one neighbourhood has been selected. Clusters G and H are much larger, thus three neighbourhoods have been chosen.

Table C.2, Selected neighbourhoods in Rotterdam

Cluster	Neighbourhood	Rank	Number of inhabitants	Number of distributed surveys	Elaboration
C	Hilligersberg-North	1	7,821	150	
F	Provenierswijk Middelland	1 3	4,758 12,050	150	The number 2 (Bergpolder) is adjacent to the number 1 (Provenierswijk). Therefore, number 3 (Middelland) has been chosen instead of 2, as it is situated elsewhere.
G	Oud Charlois Zuidwijk Vreewijk Oude Noorden	1 2 3 6	12,832 13,844 14,506 17,117	150 150 150 150	Most neighbourhoods in this cluster are situated in the south of Rotterdam. 'Oude Noorden' is the first neighbourhood in the north, and therefore included.
H	Overschie Zevenkamp Prinsenland	1 2 4	6,766 15,956 9,672	150 150	Number 3 (Hoogvliet-Zuid) is situated in a suburb, which is separated from the city of Rotterdam itself.

C.3 Delft

The municipality of Delft has 77 neighbourhoods. These are much smaller than those of Rotterdam; the largest neighbourhood in Delft has 3,395 inhabitants whereas the largest in Rotterdam has 28,366. This is not only caused by the population density, but also due to the physical size of the neighbourhoods).

Eight clusters are created, of which one does not contain any neighbourhoods and one contains three neighbourhoods with missing data regarding income. No data regarding car-ownership could be found at the level of neighbourhoods. Table C.3 gives an overview of the characteristics of the clusters, except for F which does not contain any neighbourhoods. Those which are not used for the distribution of the survey are printed in grey.

Table C.3, Clusters in Delft

Cluster		A	B	C	D	E	G	H
#Neighbourhoods		5	22	3	14	1	15	4
#Inhabitants		9,270	34,347	3,596	26,742	654	23,918	3,092
Average age	Mean	38.20	40.05	34.00	35.72	50	42.01	50.60
	Std	*5,54*	*3,45*	*5,12*	*4,48*	-	*3,41*	*2,56*
Average household size	Mean	2.64	1.87	1.50	1.46	2.30	1.87	1.68
	Std	*0,27*	*0,17*	*0,36*	*0,16*	-	*0,20*	*0,16*
Average standardised income x1,000	Mean	39.08	24.88	No data	27.16	52.10	36.93	25.10
	Std	*2,54*	*3,35*	-	*3,71*	-	*2,91*	*2,20*
Average number of cars per household		No data						

The clusters can be characterized as follows:

- Cluster A contains neighbourhoods with mostly families, with children who attend primary school. The average income is €39,000. Most residents have a high education level.
- Cluster B includes neighbourhoods with mostly singles, with an average age of 40 years and a relatively low income, as well as a low education level.
- Cluster C contains three neighbourhoods without data regarding income. Households are usually one-person households. Two of the three neighbourhoods (Centrum Zuidwest and TU Noord) are similar to those in cluster D, the other neighbourhood (Centrum Noord) is similar to neighbourhoods in cluster B.
- Cluster D includes neighbourhoods with a lot of singles. Compared to cluster B, which has a similar income, residents are on average a few years younger and have a higher education level.
- Cluster E contains only a single neighbourhood (Koningsveldbuurt), due to the high average income of households. The average age of this cluster is relatively high.
- Cluster G contains neighbourhoods with a similar income to cluster A, with an average of approximately €37,000. Inhabitants are slightly older than those in A. Households in cluster G are on average smaller than in cluster A.
- Cluster H is characterized by the relatively high age of inhabitants, in combination with a low income. More than half of the inhabitants in these clusters is single.

Nine neighbourhoods were selected. Per neighbourhood, 150 flyers were distributed.

Table C.4, Selected neighbourhoods in Delft

Cluster	Neighbourhood	Rank	Number of inhabitants	Number of distributed surveys	Elaboration
A	Hoornse hof	1	2445	100	
B	Afrikabuurt – East Heilige Land	1 3	1716 1961	100 100	2 neighbourhoods because of size of cluster Heilige Land instead of Kuyperwijk-East, because otherwise 3 adjacent neighbourhoods would be used.
D	Juniusbuurt Roland Holst	1 2	522 3395	100 100	2 neighbourhoods because of size of cluster
E	Koningsveldbuurt	1	654	100	
G	Delftzicht Indische Buurt-South	1 2	1411 2269	100 100	2 neighbourhoods because of size of cluster
H	Ministersbuurt – West		1048	100	

C.4 Amersfoort

The municipality of Amersfoort has 145 neighbourhoods in total. 22 of them are business areas and excluded from the clusters. Ten clusters are created, although also here not all contain neighbourhoods, and some neighbourhoods lack data. Increasing the number of clusters did not lead to a lower number of usable clusters. The resulting clusters are shown in table C.5, except for clusters F and G which do not contain any neighbourhoods. Those which are not used for the distribution of the survey are printed in grey. 150 flyers have been distributed per neighbourhood.

Table C.5, Clusters in Amersfoort

Cluster		A	B	C	D	E	H	I	J
#Neighbourhoods		4	1	16	40	1	9	48	4
#Inhabitants		832	168	14,203	65,094	888	7,245	68,584	937
Average age	Mean	33.12	25.54	49.32	37.65	44.40	38.20	39.50	34.13
	Std	*8,66*	-	*7,91*	*5,19*	-	*4,82*	*3,55*	*9,69*
Average household size	Mean	2.98	No data	1.73	2.61	2.5	2.56	2.01	1.48
	Std	*0,68*	-	*0,17*	*0,26*	-	*0,39*	*0,25*	*0,29*
Average standardised income x1,000	Mean	No data	36.90	31.28	36.91	79.30	55,51	30.16	No data
	Std	-	-	*4,19*	*4,43*	-	*14,10*	*4,34*	-
Average number of cars per household	Mean	No data	No data	0.76	1.12	1.50	1.33	0.79	0.97
	Std.	-	-	*0,18*	*0,14*	-	*0,23*	*0,15*	*0,17*

These neighbourhoods can be characterized as follows:

- Cluster A contains neighbourhoods which lack data regarding income and car-ownership. This cluster is therefore not included in the selection of neighbourhoods. Neighbourhoods in this cluster seem similar to those in cluster D, as far as this can be said based on known characteristics.
- Cluster B includes only a small neighbourhood (168 inhabitants in 79 households), and is therefore not included.
- Cluster C contains neighbourhouds with relatively old inhabitants in small households. The average income and car-ownership are relatively low.
- Cluster D contains neighbourhoods with many families. Income is usually between 32,000 and 41,000. The average number of cars per household is slightly larger than 1, which indicates that some households have multiple cars.
- Cluster E includes a single neighbourhood (Oranjebuurt). Inhabitants of this neighbourhood have on average the highest income of inhabitants of Amersfoort.
- Cluster H also contains neighbourhoods with families. The average income is much higher than in cluster D, but not as high as in cluster E. Car-ownership is high as well with a value of 1.33, indicating that one in three households has two cars on average.
- Cluster I contains neighbourhoods with households with a middle class income of around €30.000. The largest share of households is formed by singles, although the average household size remains 2.
- Cluster J contains smaller households (mainly one-person households). However, data regarding income lacks. Therefore no surveys are distributed in this cluster.

Eight neighbourhoods were selected, and 150 flyers were distributed per neighbourhood.

Table C.6, Selected neighbourhoods in Amersfoort

Cluster	Neighbourhood	Rank	Number of inhabitants	Number of distributed surveys	Elaboration
C	Dorrestein	1	805	100	
D	Vermeerkwartier-East	1	2038	100	3 neighbourhoods because of size of cluster
	Wintertuinen	2	939	100	
	Vlinderbuurt	3	1271	100	
E	Oranjebuurt	1	888	100	
H	Heideweg e.o. (Vathorst)	1	322	100	
I	De Driehoek	1	1386	100	Number 4 instead of number 3 has been chosen, because number 3 is close to number 2.
	Rivierenbuurt-East	2	830	100	
	Watervogelbuurt	4	1552	100	

D. Expectations regarding interactions

Different characteristics of people are expected to influence their preferences for a neighbourhood. The following paragraphs describe expectations regarding this influence of the following groups of characteristics:

- Socio-demographics
- Attitudes
- Preferences for transport modes
- Preferences for the location of the neighbourhood

D.1 Interaction between attributes and socio-demographics

It is expected that socio-demographics have an effect on the preferences of respondents. For example, households who own a car are expected to be more sensitive for the access for cars to a neighbourhood. The following socio-demographics are used: age, household composition, education level, income and car-ownership. Regarding household size, two different interactions are estimated: an interaction with households with children in general, and an interaction with children below the age of twelve. This allows to test not only whether having children affects preferences, but also whether the age of these children plays a role. Note that car-ownership is included in the model with socio-demographics, even though car-ownership is not a socio-demographic.

The following table gives an overview of the expectations regarding the interaction between the attributes and socio-demographics. No effects are expected regarding an interaction with socio-demographics, the walking time to public transport, available amenities and green in the neighbourhood. Therefore, these are not included in the table.

Table D.1, Expectations regarding the interaction between socio-demographics and attributes

Attribute	Socio-demographic	Expectations
Access for cars	General	Streets with access for cars are preferred over those without access. Speed is of smaller importance.
	Age	No effects different from general expected
	Household composition	Households with especially young children prefer a low speed or no access, as this increases safety.
	Education level	No effects different from general expected
	Income	No effects different from general expected
	Car-ownership	Persons who own a car prefer to have access to the street by car
Walking time to parking	General	Shorter walking times are preferred over longer ones.
	Age	Older persons have a relatively strong preference for a short walking time compared to other age groups.
	Household composition	Households with children do not want to walk a long time to their car, and prefer therefore short walking times. The same accounts for elderly (which are usually households without children). Singles and couples without children are less sensitive for longer walking times.
	Education level	No effects different from general expected
	Income	No effects different from general expected
	Car-ownership	Persons who own a car prefer short walking times.

Table D.2, Expectations regarding the interaction between socio-demographics and attributes

Attribute	Socio-demographic	Expectations
Available public transport	General	Neighbourhoods where a tram is available are preferred over those with only a bus.
	Age	Younger persons (below 40 years) attach more value to public transport than others (40+)(Puhe and Schippl, 2014)
	Household composition	No effects different from general expected
	Education level	Higher educated persons attach more value to public transport than lower educated persons. Mainly due to attitudes.
	Income	No effects different from general expected
	Car-ownership	No effects different from general expected
Available shared vehicles	General	
	Age	No effects different from general expected
	Household composition	No effects different from general expected
	Education level	No effects different from general expected
	Income	No effects different from general expected
	Car-ownership	The electric (cargo) bike is of larger importance than the car
Amenities in public space	General	
	Age	Older people prefer benches, while younger people prefer playgrounds (for their children) or outdoor sports facilities (for themselves)
	Household composition	Households with young children attach more value to playgrounds and households with older children attach more value to outdoor sports facilities compared to other households.
	Education level	No effects different from general expected
	Income	No effects different from general expected
	Car-ownership	No effects different from general expected

D.2 Interaction between attributes and attitudes

The following table give an overview of the expectations regarding the interaction between the attributes and attitudes. These attitudes were collected via statements. The measured attitudes are most likely to influence access for cars, and the walking time to parking, which is also car-related. Statements did not only focus on the car, but also on green and the availability of many amenities. However, almost all respondents stated that green was important to them, which makes it unlikely that an interaction between the types of green, and the statement regarding green would give insight into different opinions.

To prevent a model with a very large number of interactions, four parameters were estimated per expected interaction: 2 for persons who (strongly) agreed (1 for level 1, and 1 for level 2), and 2 for persons who (strongly) disagreed. The option 'neither agree/disagree' is used as the reference.

Table D.3, Expectations regarding the interaction between attitudes and attributes.

Attribute	Statements	Expectations
Access for cars	General	Streets with access for cars are preferred over those without access. Speed is of smaller importance.
	1. Freedom by car	Persons who agree have a stronger preference for access for cars to the street than persons who disagree.
	2. Necessity of car-usage	No effects different from general expected
	3. Relocate to car-reduced street	Persons who agree have a strong preference for streets in which cars have access.
	4. Few cars on the street	Persons who agree prefer streets in which cars do not have access.
	5. Much green in the neighbourhood	Persons who agree prefer streets in which cars do not have access or drive slowly.
	6. Amenities in the neighbourhood	No effects expected.
	7. Relocate if street made greener	Persons who agree have a strong preference for streets in which cars have access.
Walking time to parking	General	Shorter walking times are preferred over longer ones.
	1. Freedom by car	No effects different from general expected
	2. Necessity of car-usage	No effects different from general expected
	3. Relocate to car-reduced street	Persons who agree have an even stronger preference for short walking times than persons in general.
	4. Few cars on the street	Persons who agree prefer a slightly longer walking time (4 minutes) over parking the car in the street (<1 minute)
	5. Much green in the neighbourhood	Persons who agree prefer a slightly longer walking time (4 minutes) over parking the car in the street (<1 minute)
	6. Amenities in the neighbourhood	No effects different from general expected.
	7. Relocate if street made greener	Persons who agree have an even stronger preference for short walking times than persons in general.
Available amenities	6. Amenities in the neighbourhood	Persons who agree with this statement will attach more value to levels with more amenities.

D.3 Transport mode preferences

Respondents were asked which mode they preferred for different trips. These were trips to: work, education, the supermarket, shopping, restaurants and leisure. To analyse the effect of transport mode preferences on the residential location choice, the preferred modes for a trip to work and to a supermarket have been used. These trip types are trips people regularly make, and represent on one hand trips which are short (supermarket) and trips which are relatively longer (work), but still at an acceptable distance for regular travels.

Attribute	Transport mode	Expectation	
		To work	To supermarket
Access for cars	General	Streets with access for cars are preferred over those without access. Speed is of smaller importance.	
	Car	Persons who prefer to travel to work by car are regular car users. It is likely that access for cars is more important for them than for people in general	Access by cars is preferred, as it allows to drop of groceries.
	Bike Walk Train	Access for cars is of smaller importance because these persons do not use their car regularly	Access for cars is of smaller importance because these persons do not use their car regularly
Walking time to parking	General	Shorter walking times are preferred over longer ones.	
	Car	These persons have a strong preference for a walking time of <1 minute	These persons have a preference for a walking time of <1 minute, nonetheless, this preference is weaker than that of persons who prefer to travel to work by car.
	Bike Walk Train	Walking times of 4 minutes are preferred	Walking times of 4 minutes are preferred
Available public transport	General	Neighbourhoods where a tram is available are preferred over those with only a bus because they are likely to be better connected to the rest of the city.	
	Car Bike Walk	No differences from general are expected.	
	Train	Neighbourhoods close to the train station are preferred over other neighbourhoods.	
	Bike Walk		

	Train	

Table D.4 below gives an overview of the expectations for the effect of transport mode preferences on the different attributes. Note that some modes are not included, and interaction parameters for those modes will not be estimated. These are:

- Train when it comes to trips to the supermarket. As could be expected, the train was never chosen as preferred mode to do groceries.
- Bus/tram/metro: these are not included because their share is also very small. 1.7% of the respondents prefers to travel with BTM to work, and 0.3% to the supermarket.
- Shared car: this was never chosen as preferred mode to travel to work or the supermarket.

Table D.4, Table D.3, Expectations regarding the interaction between transport mode preferences and attributes. Only those attributes where interactions were expected are included in the table.

D.4 Interactions with residential location preference

Lastly, some interactions with the preferred type of neighbourhood are expected. Respondents could state their preference based on five different neighbourhoods: the centre of a city, neighbourhoods adjacent to the city centre, other neighbourhoods of a city, a village in an urban region and a village in a rural region. It is expected that persons with a preference to live in the city centre attach less value to access for cars and to the walking time to cars. Also, the closer people want to live to the city centre, the stronger their preference for having many amenities nearby is expected to be. Regarding the other amenities, no effects are expected.

E. Tables descriptive statistics

This appendix gives an overview of the descriptive statistics in the form of tables. These are used to create the graphs as shown in chapter 6.1.

Age distribution

Age	Number in sample	Percentage				
		Sample	Rotterdam	Delft	Amersfoort	Netherlands
18-26 years	40	19.4%	17.6%	26.4%	13.6%	14.0%
27-39 years	23	11.2%	25.9%	22.7%	22.6%	20.3%
40-54 years	53	25.7%	23.0%	18.3%	26.9%	24.4%
55-64 years	51	24.8%	14.4%	13.5%	17.1%	17.0%
65-74 years	25	12.1%	9.6%	10.9%	11.3%	13.9%
75 years and older	14	6.8%	9.5%	8.2%	8.6%	10.5%

Household composition

Age	Number in sample	Percentage				
		Sample	Rotterdam	Delft	Amersfoort	Netherlands
Single without children	57	29.1%	43.7%	53.3%	34.1%	35.9%
Couple without children	87	44.4%	20.4%	21.1%	25.0%	27.0%
Single with children	8	4.1%	9.5%	5.7%	7.2%	6.9%
Couple with children	44	22.5%	26.4%	19.9%	33.7%	30.3%
Not stated	15	-	-	-	-	-

Education level

Education level	Number in sample	Percentage				
		Sample	Rotterdam	Delft	Amersfoort	Netherlands
Low	21	14.9%	31.4%	20.4%	23.3%	29.8%
Middle	35	24.8%	37.6%	35.6%	36.2%	37.3%
High	85	60.3%	31.0%	44.0%	40.6%	32.9%
Not stated	70	-	-	-	-	-

Income level

Class Level	Number in sample	Percentage Sample	Rotterdam	Delft	Amersfoort	Netherlands
Low	**62**	**36.6%**	**52.5%**	**54.0%**	**36.0%**	**40.0%**
<€10k	11	6.5%				
€10k to €20k	8	4.7%				
€20k to €30k	12	7.1%				
€30k to €40k	31	18.3%				
Middle	**90**	**53.3%**	**33.4%**	**29%**	**39.0%**	**40.0%**
€40k to €50k	24	14.2%				
€50k to €60k	29	17.2%				
€60k to €70k	10	5.9%				
€70k to €80k	12	7.1%				
€80k to €90k	10	5.9%				
€90k to €100k	5	3.0%				
High	**17**	**10.1%**	**14.1%**	**16.0%**	**24.7%**	**20.0%**
>€100k	17	10.1%				
Prefer_not_to_say	42	-				

Note that class boundaries for the references are different than in the sample. Nonetheless, the comparison gives an impression.

Main daily activity

	Sample		MPN (highly) urban areas	
Activity	Number	Percentage	Number	Percentage
Employed	148	71.5%	1,842	51.7%
Unemployed	8	3.9%	95	2.7%
Retired	33	15.9%	688	19.3%
Student	13	6.3%	441	12.4%
Else	5	2.4%	496	13.9%
Skipped	4	-	735	-

Car-ownership

Cars in household	Number	Percentage Sample	Netherlands
0 cars	48	22.8%	26.5%
1 car	113	53.6%	47.0%
2 cars	40	19.0%	20.5%
≥2 cars	9	4.3%	6.0%
Not stated	1	-	

Travel behaviour of sample

Frequence	5 or more days/week	1-4 days/week	1-3 days/month	Less than 1 day/month	Never
Walk	54.0%	32.9%	8.4%	2.4%	2.4%
Bike	33.1%	43.9%	10.5%	5.8%	6.7%
Car	11.6%	40.9%	21.8%	11.5%	14.2%
Train	3.3%	13.9%	21.9%	36.3%	24.7%
BTM	1.5%	8.0%	17.6%	37.3%	35.7%
Shared car	0%	0.5%	1.9%	9.6%	88.1%
Shared bike/moped	0%	1.4%	2.4%	6.8%	89.3%

Transport preferences of sample

Mode	Work	Education	Supermarket	Shopping	Restaurant	Leisure
Walk	36.6%	12.3%	16.2%	9.4%	6.0%	14.4%
Bike	36.1%	56.9%	50.5%	66.8%	72.1%	70.8%
Car	6.4%	6.2%	33.3%	19.8%	16.9%	13.4%
Train	18.0%	23.1%	0.0%	0.0%	1.0%	0.0%
BTM	2.9%	1.5%	0.0%	4.0%	3.5%	1.0%
Shared car	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%
Shared bike/moped	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Attitudes

	1		2		3	4	5	6	7
Opinion	Sample	MPN	Sample	MPN	Sample	Sample	Sample	Sample	Sample
Strongly agree	30.8%	27.0%	21.3%	15.3%	0.0%	20.9%	58.3%	23.7%	0.0%
Agree	41.2%	51.4%	46.0%	30.0%	30.8%	39.3%	35.1%	44.6%	7.6%
Neither agree/disagree	16.1%	10.1%	20.9%	22.3%	28.4%	28.9%	5.7%	23.2%	19.0%
Disagree	4.3%	2.7%	9.0%	18.6%	26.5%	7.6%	0.5%	7.1%	40.3%
Strongly disagree	7.1%	1.6%	2.4%	3.9%	13.7%	1.9%	0.0%	0.5%	32.7%
No opinion	0.5%	7.2%	0.5%	9.9%	0.5%	1.4%	0.5%	1.0%	0.5%

F. Elaboration on estimated models

Multiple models were estimated. First, an MNL-model was estimated with parameters for the attributes only. Next, interactions were added between the attributes and a group of characteristics. These groups are:

- Socio-demographics
- Attitudes
- Transport mode preferences
- Preferences regarding the location of the neighbourhood

These individual models were used to select the model which can be well interpreted and which makes a good estimation. Based on this, a ML-model was estimated, which includes interactions with socio-demographics.

F.1 MNL – Attributes only

The model has been estimated with parameters for all attributes. All attributes have three levels and are dummy-coded. As a result of this, parameters for two levels have to be estimated, whereas the third level is the reference level. Statistics of this model are given in table F.1.

Not alle estimated betas are significantly different from zero. Those which are not at the level of 90% are those for:

- A walking time of 4 minutes to parking
- The availability of only a shared car
- A walking distance of 4 minutes to public transport and shared vehicles
- The availability of a supermarket, primary school and (non) food shops
- Both levels of green
- Both levels of amenities in public space

Nonetheless, these insignificant betas are not removed from the model.

Table F.1, Statistics of base MNL-model

	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC
Attributes only	16	-1162.37	0.105	2356.75	2445.54

F.2 MNL with socio-demographics

This model builds upon the MNL-model, but interactions with socio-demographics are added. First, the model has been estimated with all attributes and those interactions which were expected in the hypotheses. Estimating for all possible interactions could result in estimates of parameters which are not likely, even though the model finds them. Next to that, it would result in a model with an enormous number of parameters, of which many cannot be interpreted.

Stepwise, the following interactions have been removed:

1. Interaction between age (65+) and the walking time to parking.
2. Interaction between households with children and walking time to parking.
3. Interaction between households with young children and amenities in public space.
4. Interaction between households with children and access for cars.
5. Interaction between households with young children and access for cars.
6. Interaction between car-ownership and availability of shared vehicles.

After these 5 steps, all interactions are at least 90% significant for one level. Table F.2 gives an overview of the statistics of the estimated models, after each step. This reveals that, even though the loglikelihood decreases, the adjusted rho squared increases, thus the model takes more uncertainty away.

Table F.2, Statistic values of estimated models with interactions with socio-demographics

	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC
All interactions	42	-1124.39	0.114	2332.78	2565.87
Step 1	40	-1124.68	0.117	2325.35	2536.24
Step 2	38	-1124.68	0.117	2325.35	2536.24
Step 3	36	-1125.30	0.118	2322.61	2522.39
Step 4	34	-1125.84	0.119	2319.68	2508.37
Step 5	32	-1126.37	0.120	2316.75	2494.34
Step 6	30	-1127.60	0.121	2315.20	2481.68

F.3 MNL with attitudes

This model also builds upon the MNL-model from paragraph F.1. It is first estimated with all expected interactions due to attitudes being active, except for the interactions with statement 5 which asks respondents whether having green in their neighbourhood is important. This interaction has been removed, because only 1 respondent disagreed with this statement and all others agreed.

Also here, not all interactions are significant. Interactions with at least two insignificant parameters are removed stepwise.

1. Interaction between available amenities and statement 1 (The car gives me a feeling of freedom).
2. Interaction between amenities in the neighbourhood and statement 6 (I like having a diverse range of amenities in my neighbourhood, such as shops, schools and restaurants). This was not expected to become not significant. However, it could be caused by the fact that most respondents either agreed, or were neutral (only 7.4% disagreed).
3. Interaction between walking time to parking and statement 3 (I would only relocate to a house where I can park my car directly next to/in front of my house). Persons who strongly agreed with this statement were excluded.
4. Interaction between car access and statement 3. It is remarkable that, after removing this interaction, the adjusted rho squared decreases, even though it is only a very small decrease.

After removing these interactions, all remaining interactions have at least one (out of four) 90%-significant parameter. Table F.3 gives the statistics values of the estimated models.

Table F.3, Statistic values of estimated models with interactions with attitudes

	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC
All interactions	52	-1123.47	0.107	2350.95	2639.53
Step 1	48	-1124.44	0.110	2344.87	2611.25
Step 2	44	-1125.88	0.112	2339.77	2583.95
Step 3	40	-1128.02	0.113	2336.05	2558.03
Step 4	36	-1134.16	0.112	2340.33	2540.11

F.4 MNL with transport mode preferences

Like the previous sections, this model uses the MNL-model as estimated in section F.1 as base, and adds interactions to this. Here, these are interactions regarding transport preferences, as presented in section D.3. Like the previous sections, firstly all interactions are included. Next, stepwise the least significant interactions are removed, until only interactions which are at least 90% significant for one of the levels remain.

1. Interaction between access for cars and persons who prefer to travel to work by car.
2. Interaction between the walking time to parking and persons who prefer to travel to work by car.
3. Interaction between the walking time to parking and persons who prefer to travel to the supermarket by car.

After removing these interactions, all interactions are at least for one level 90% significant. Table F.4 gives the statistic values of the estimated models. The two remaining interactions reveal that persons who like to travel to the supermarket by car have an even stronger preference for streets to which cars have access, than persons who like to travel to the supermarket with another mode. This is no surprise, since access for cars to the street reduces the probability that one has to walk a long distance with groceries. The other significant interaction is the interaction between available public transport and persons who like to travel to work by train. These persons have a stronger preference for the train over other modes, compared to persons who like to travel differently to work.

Table F.4, Statistic values of estimated models with interactions with transport mode preferences

	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC
All interactions	26	-1153.34	0.105	2358.77	2503.06
Step 1	24	-1153.63	0.106	2355.25	2488.44
Step 2	22	-1155.17	0.106	2354.34	2476.43
Step 3	20	-1156.51	0.107	2353.02	2464.01

F.5 MNL with residential location preferences

A model in which interactions between car-access and distance to parking was incorporated did not result in any (90%) significant parameters regarding these interactions. Leaving out those estimates for persons who preferred to live in a village resulted in a model with only one (90%) significant parameter, which is still a low number as 8 parameters are estimated. The significant parameter is the interaction between car access with 5 km/h to the street and people who prefer to live in the city centre. The utility contribution of having access with 5 km/h compared to a street where cars do not have access drops from -0.720 to -1.698. The utility contribution of a having access with 30 km/h drops as well, but to a smaller extend (from -0.644 to -1.179), but this is only significant at 60%. Nonetheless, it reveals that residents of city centres have an even stronger preference for car-free streets than those of other neighbourhoods.

Table F.5, Statistics of MNL-model with interaction with residential location preferences

	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC
All interactions	32	-1157.82	0.097	2379.64	2557.23
Only urban	24	-1159.24	0.102	2366.49	2499.68

F.6 Overview of all MNL-models

Table F.6 gives an overview of the final MNL-models with interactions with a group of characteristics. The best model can be chosen using the likelihood ratio statistic (LRS): the probability that it is better than the base model due to a coincidence. Both the model with socio-demographics and attitudes have a very low LRS. Of these, the model with socio-demographics has a better adjusted rho squared. Therefore, the interactions with socio-demographics are included in the ML-model.

Table F.6, Overview of estimated MNL-models with interactions

Interactions	Number of parameters	Final loglikelihood	$\bar{\rho}^2$	AIC	BIC	LRS
No interactions	16	-1162.37	0.105	2356.75	2445.54	-
Socio-demographics	30	-1127.60	0.121	2315.20	2481.68	LRS<0.5%
Attitudes	36	-1134.16	0.112	2340.33	2540.11	LRS<0.5%
Transport preferences	20	-1156.51	0.107	2353.02	2464.01	2.5%>LRS>1%
Residential location preference	24	-1159.24	0.102	2366.49	2499.68	LRS>10%

F.7 Mixed logit – preferred neighbourhood

Multiple ML-models have been estimated, each with a different number of draws. Table F.7 gives an overview of the estimated ML-models. At 500 draws, the mean, standard deviation and loglikelihood become stable.

Table F.7, Estimated ML-models for the preference for a neighbourhood, including an opt-out

Number of draws	Mean of constant	Standard deviation of constant	Final loglikelihood
10	0.622	2.225	-1682.18
20	0.585	2.081	-1680.99
50	0.625	2.053	-1676.98
100	0.627	2.009	-1677.11
200	0.630	-1.984	-1676.93
500	0.628	-1.987	-1677.00
1000	0.628	-1.988	-1677.04
2000	0.628	-1.988	-1677.06

F.8 Mixed logit – preferred neighbourhood and relinquishing car

Multiple ML-models have been estimated, each with a different number of draws. Table F.8 gives an overview of the estimated ML-models. At 2000 draws, the mean, standard deviation and loglikelihood become stable. Compared to the ML-model without accounting for relinquishing a car, more models are estimated to test whether stability was reached, because of the larger differences in the mean of the constant.

Table F.8, Estimations for the ML-model for the preference for a neighbourhood combined with the likelihood to relinquish a car

Number of draws	Mean of constant	Standard deviation of constant	Final loglikelihood
10	-3.037	8.027	-223.37
20	-4.737	8.334	-215.40
50	-7.055	8.786	-211.25
100	-5.808	6.942	-211.83
200	-6.025	7.148	-211.85
500	-6.094	-7.322	-211.97
1.000	162.002	7.314	-212.09
2.000	-6.089	7.312	-212.10
5.000	-7.040	7.298	-212.10
10.000	-5.977	7.308	-212.10

G. Profiles

The betas for interactions which were estimated allow to create 24 different profiles of households. Some betas are the same for all households, because no interactions were included. Other betas differ per household type. This appendix gives an overview of the betas for the 24 different profiles. The reader could create these profiles by himself based on the given values in section 6.2, but by providing this overview, one can easier compare the preference of different persons without the need to make calculations. Like in section 6.2, a large value means that something has a large effect on the utility on a neighbourhood, and a small value a small effect. For every attribute, three levels are present. The third acts as reference, and has thereby the value 0. The others can have a positive or negative value. A positive value indicates that it is preferred over the reference level, and a negative vice versa.

Parameter	
C (mean)	Mean of constant
C (st.dev.)	Standard deviation of constant
β_{CA_1}	Access for cars with 30 km/h
β_{CA_2}	Access for cars with 5 km/h
$\beta_{CA_{ref}}$	No access for cars
β_{WTtP_1}	<1 minute walking time to parking
β_{WTtP_2}	4 minutes walking time to parking
$\beta_{WTtP_{ref}}$	8 minutes walking time to parking
β_{PT_1}	Available public transport: Bus
β_{PT_2}	Available public transport: Bus and tram
$\beta_{PT_{ref}}$	Available public transport: Bus, tram and train
β_{SV_1}	No available shared vehicles
β_{SV_2}	Available shared vehicles: car
$\beta_{SV_{ref}}$	Available shared vehicles: car and electric (transport) bike
$\beta_{WTtPTSV_1}$	<1 minute walking time to public transport and shared vehicles
$\beta_{WTtPTSV_2}$	4 minute walking time to public transport and shared vehicles
$\beta_{WTtPTSV_{ref}}$	8 minute walking time to public transport and shared vehicles
β_{AM_1}	Available amenities within 5 minutes walking: supermarket and primary school
β_{AM_2}	Available amenities within 5 minutes walking: supermarket, primary school and (non-) food shops
$\beta_{AM_{ref}}$	Available amenities within 5 minutes walking: supermarket, primary school, (non-) food shops and restaurants
β_{GR_1}	Green in the street and multiple small parks
β_{GR_2}	Green in the street and one large park
$\beta_{GR_{ref}}$	Much green in the street but no park
β_{AMiPS_1}	Available amenities in public space: Benches
β_{AMiPS_2}	Available amenities in public space: Benches and playgrounds
$\beta_{AMiPS_{ref}}$	Available amenities in public space: Benches, playgrounds and outdoor sports facilities

Socio-demographic						
Age	**<40**	**<40**	**<40**	**<40**	**<40**	**<40**
Education level	**High**	**High**	**High**	**High**	**High**	**High**
Children	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Children below 12	**No**	**No**	**No**	**Yes**	**No**	**Yes**
Car	**No**	**Yes**	**No**	**No**	**Yes**	**Yes**
Parameter						
C (mean)	0.63	0.63	0.63	0.63	0.63	0.63
C (st.dev.)	-1.99	-1.99	-1.99	-1.99	-1.99	-1.99
β_{CA_1}	0.29	0.70	0.29	0.06	0.70	0.46
β_{CA_2}	0.21	0.88	0.21	-0.18	0.88	0.49
$\beta_{CA_{ref}}$	0	0	0	0	0	0
β_{WTtP_1}	0.33	1.34	0.33	1.05	1.34	2.06
β_{WTtP_2}	0.22	0.71	0.22	0.79	0.71	1.27
$\beta_{WTtP_{ref}}$	0	0	0	0	0	0
β_{PT_1}	-0.70	-0.70	-0.70	-0.70	-0.70	-0.70
β_{PT_2}	-0.96	-0.96	-0.96	-0.96	-0.96	-0.96
$\beta_{PT_{ref}}$	0	0	0	0	0	0
β_{SV_1}	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
β_{SV_2}	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
$\beta_{SV_{ref}}$	0	0	0	0	0	0
$\beta_{WTtPTSV_1}$	0.37	0.37	0.37	0.37	0.37	0.37
$\beta_{WTtPTSV_2}$	0.33	0.33	0.33	0.33	0.33	0.33
$\beta_{WTtPTSV_{ref}}$	0	0	0	0	0	0
β_{AM_1}	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41
β_{AM_2}	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
$\beta_{AM_{ref}}$	0	0	0	0	0	0
β_{GR_1}	0.33	0.33	0.33	0.33	0.33	0.33
β_{GR_2}	0.39	0.39	0.39	0.39	0.39	0.39
$\beta_{GR_{ref}}$	0	0	0	0	0	0
β_{AMiPS_1}	-0.11	-0.11	-0.78	-0.78	-0.78	-0.78
β_{AMiPS_2}	-0.14	-0.14	-0.47	-0.47	-0.47	-0.47
$\beta_{AMiPS_{ref}}$	0	0	0	0	0	0

Socio-demographic						
Age	<40	<40	<40	<40	<40	<40
Education level	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle
Children	No	No	Yes	Yes	Yes	Yes
Children below 12	No	No	No	Yes	No	Yes
Car	No	Yes	No	No	Yes	Yes
Parameter						
C (mean)	0.63	0.63	0.63	0.63	0.63	0.63
C (st.dev.)	-1.99	-1.99	-1.99	-1.99	-1.99	-1.99
β_{CA_1}	0.29	0.70	0.29	0.06	0.70	0.46
β_{CA_2}	0.21	0.88	0.21	-0.18	0.88	0.49
$\beta_{CA_{ref}}$	0	0	0	0	0	0
β_{WTtP_1}	0.33	1.34	0.33	1.05	1.34	2.06
β_{WTtP_2}	0.22	0.71	0.22	0.79	0.71	1.27
$\beta_{WTtP_{ref}}$	0	0	0	0	0	0
β_{PT_1}	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36
β_{PT_2}	-0.54	-0.54	-0.54	-0.54	-0.54	-0.54
$\beta_{PT_{ref}}$	0	0	0	0	0	0
β_{SV_1}	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
β_{SV_2}	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
$\beta_{SV_{ref}}$	0	0	0	0	0	0
$\beta_{WTtPTSV_1}$	0.37	0.37	0.37	0.37	0.37	0.37
$\beta_{WTtPTSV_2}$	0.33	0.33	0.33	0.33	0.33	0.33
$\beta_{WTtPTSV_{ref}}$	0	0	0	0	0	0
β_{AM_1}	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41
β_{AM_2}	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
$\beta_{AM_{ref}}$	0	0	0	0	0	0
β_{GR_1}	0.33	0.33	0.33	0.33	0.33	0.33
β_{GR_2}	0.39	0.39	0.39	0.39	0.39	0.39
$\beta_{GR_{ref}}$	0	0	0	0	0	0
β_{AMiPS_1}	-0.11	-0.11	-0.78	-0.78	-0.78	-0.78
β_{AMiPS_2}	-0.14	-0.14	-0.47	-0.47	-0.47	-0.47
$\beta_{AMiPS_{ref}}$	0	0	0	0	0	0

Socio-demographic						
Age	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65
Education level	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle
Children	No	No	Yes	Yes	Yes	Yes
Children below 12	No	No	No	Yes	No	Yes
Car	No	Yes	No	No	Yes	Yes
Parameter						
C (mean)	0.63	0.63	0.63	0.63	0.63	0.63
C (st.dev.)	−1.99	−1.99	−1.99	−1.99	−1.99	−1.99
β_{CA_1}	0.29	0.70	0.29	0.06	0.70	0.46
β_{CA_2}	0.21	0.88	0.21	−0.18	0.88	0.49
$\beta_{CA_{ref}}$	0	0	0	0	0	0
β_{WTtP_1}	0.33	1.34	0.33	1.05	1.34	2.06
β_{WTtP_2}	0.22	0.71	0.22	0.79	0.71	1.27
$\beta_{WTtP_{ref}}$	0	0	0	0	0	0
β_{PT_1}	−0.53	−0.53	−0.53	−0.53	−0.53	−0.53
β_{PT_2}	−0.39	−0.39	−0.39	−0.39	−0.39	−0.39
$\beta_{PT_{ref}}$	0	0	0	0	0	0
β_{SV_1}	−0.23	−0.23	−0.23	−0.23	−0.23	−0.23
β_{SV_2}	−0.10	−0.10	−0.10	−0.10	−0.10	−0.10
$\beta_{SV_{ref}}$	0	0	0	0	0	0
$\beta_{WTtPTSV_1}$	0.37	0.37	0.37	0.37	0.37	0.37
$\beta_{WTtPTSV_2}$	0.33	0.33	0.33	0.33	0.33	0.33
$\beta_{WTtPTSV_{ref}}$	0	0	0	0	0	0
β_{AM_1}	−0.41	−0.41	−0.41	−0.41	−0.41	−0.41
β_{AM_2}	−0.25	−0.25	−0.25	−0.25	−0.25	−0.25
$\beta_{AM_{ref}}$	0	0	0	0	0	0
β_{GR_1}	0.33	0.33	0.33	0.33	0.33	0.33
β_{GR_2}	0.39	0.39	0.39	0.39	0.39	0.39
$\beta_{GR_{ref}}$	0	0	0	0	0	0
β_{AMiPS_1}	−0.11	−0.11	−0.78	−0.78	−0.78	−0.78
β_{AMiPS_2}	−0.14	−0.14	−0.47	−0.47	−0.47	−0.47
$\beta_{AMiPS_{ref}}$	0	0	0	0	0	0

Socio-demographic						
Age	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65	≥40 and <65
Education level	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle
Children	No	No	Yes	Yes	Yes	Yes
Children below 12	No	No	No	Yes	No	Yes
Car	No	Yes	No	No	Yes	Yes
Parameter						
C (mean)	0.63	0.63	0.63	0.63	0.63	0.63
C (st.dev.)	-1.99	-1.99	-1.99	-1.99	-1.99	-1.99
β_{CA_1}	0.29	0.70	0.29	0.06	0.70	0.46
β_{CA_2}	0.21	0.88	0.21	-0.18	0.88	0.49
$\beta_{CA_{ref}}$	0	0	0	0	0	0
β_{WTtP_1}	0.33	1.34	0.33	1.05	1.34	2.06
β_{WTtP_2}	0.22	0.71	0.22	0.79	0.71	1.27
$\beta_{WTtP_{ref}}$	0	0	0	0	0	0
β_{PT_1}	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18
β_{PT_2}	0.03	0.03	0.03	0.03	0.03	0.03
$\beta_{PT_{ref}}$	0	0	0	0	0	0
β_{SV_1}	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23
β_{SV_2}	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
$\beta_{SV_{ref}}$	0	0	0	0	0	0
$\beta_{WTtPTSV_1}$	0.37	0.37	0.37	0.37	0.37	0.37
$\beta_{WTtPTSV_2}$	0.33	0.33	0.33	0.33	0.33	0.33
$\beta_{WTtPTSV_{ref}}$	0	0	0	0	0	0
β_{AM_1}	-0.41	-0.41	-0.41	-0.41	-0.41	-0.41
β_{AM_2}	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
$\beta_{AM_{ref}}$	0	0	0	0	0	0
β_{GR_1}	0.33	0.33	0.33	0.33	0.33	0.33
β_{GR_2}	0.39	0.39	0.39	0.39	0.39	0.39
$\beta_{GR_{ref}}$	0	0	0	0	0	0
β_{AMiPS_1}	-0.11	-0.11	-0.78	-0.78	-0.78	-0.78
β_{AMiPS_2}	-0.14	-0.14	-0.47	-0.47	-0.47	-0.47
$\beta_{AMiPS_{ref}}$	0	0	0	0	0	0

Socio-demographic				
Age	≥65	≥65	≥65	≥65
Education level	High	High	Low/middle	Low/middle
Children	No	No	No	No
Children below 12	No	No	No	No
Car	No	Yes	No	Yes
Parameter				
C (mean)	0.63	0.63	0.63	0.63
C (st.dev.)	-1.99	-1.99	-1.99	-1.99
β_{CA_1}	0.29	0.70	0.29	0.70
β_{CA_2}	0.21	0.88	0.21	0.88
$\beta_{CA_{ref}}$	0	0	0	0
β_{WTtP_1}	0.33	1.34	0.33	1.34
β_{WTtP_2}	0.22	0.71	0.22	0.71
$\beta_{WTtP_{ref}}$	0	0	0	0
β_{PT_1}	-0.53	-0.53	-0.18	-0.18
β_{PT_2}	-0.39	-0.39	0.03	0.03
$\beta_{PT_{ref}}$	0	0	0	0
β_{SV_1}	-0.23	-0.23	-0.23	-0.23
β_{SV_2}	-0.10	-0.10	-0.10	-0.10
$\beta_{SV_{ref}}$	0	0	0	0
$\beta_{WTtPTSV_1}$	0.37	0.37	0.37	0.37
$\beta_{WTtPTSV_2}$	0.33	0.33	0.33	0.33
$\beta_{WTtPTSV_{ref}}$	0	0	0	0
β_{AM_1}	-0.41	-0.41	-0.41	-0.41
β_{AM_2}	-0.25	-0.25	-0.25	-0.25
$\beta_{AM_{ref}}$	0	0	0	0
β_{GR_1}	0.33	0.33	0.33	0.33
β_{GR_2}	0.39	0.39	0.39	0.39
$\beta_{GR_{ref}}$	0	0	0	0
β_{AMiPS_1}	-0.25	-0.25	-0.25	-0.25
β_{AMiPS_2}	-0.40	-0.40	-0.40	-0.40
$\beta_{AMiPS_{ref}}$	0	0	0	0

H. Characteristics of selected neighbourhoods

This appendix gives an overview of the selected neighbourhoods and the selected attribute levels. Characteristics of these neighbourhoods are, logically, not exactly similar to the available attribute levels. The attribute levels which best reflect the characteristics of a neighbourhood are selected, even though this can mean that for example more or less forms of public transport or amenities are present in the selected level compared to reality. In some cases, multiple amenities are available, but at long walking times. Therefore, sometimes a lower level of amenities has been chosen, to compensate for the poor accessibility. It should however be noted that this study uses just walking to amenities, and not cycling. When cycling would be included, longer distances would be acceptable. The descriptions in the following tables elaborate on the choices made.

H.1 Merwedekanaalzone

The Merwedekanaalzone is a new neigbourhood along the Merwede channel in the centre of Utrecht. It is supposed to become the largest car-free neighbourhood of the Netherlands, featuring housing for over 10,000 residents (Municipality of Utrecht et al., 2021). The Merwedekanaalzone consists of multiple parts. For this study, the central part, Stadswijk Merwede, has been used.

Table H.1, Attributes of Merwedekanaalzone

Attribute	Description	Level
Access for cars	Cars can enter some streets of the neighbourhood. These are only access roads, such that cars from the main road (Europalaan) can enter the neighbourhood. Cars have no access to most of the streets.	No access
Walking time to parking	A rough estimation based on drawings in the urban vision and Google Maps reveals a usual walking distance of 200m, which complies most with the level 4 minutes.	4 minutes
Public transport	A fast bus connection with the central station of Utrecht will be realised. Possibly, this will be transformed into a tram line in the feature, but this is not certain yet. Note that train stations are close, but not close enough to walk to them. Cycling however takes	Bus
Shared vehicles	A wide variety of shared vehicles will be available.	Shared car and electric (transport) bike
Walking time to public transport and shared vehicles	The walking distance to mobility hubs, which feature both a bus stop and shared vehicles is at most 550m, but generally much less.	4 minutes
Amenities	This neighbourhood is an urban neighbourhood with a high density of functions. Many amenities are available to support active modes.	Supermarket, primary school, (non) food shops and restaurants
Green	Public space in Stadswijk Merwede should be as green as possible. The eastern side, along the Merwede channel, forms a long park. Park Transwijk is very close as well, although outside this neighbourhood.	Green in the street and one large park
Amenities in public space	The urban vision acknowledges the importance of playing and sporting. Many locations in the neighbourhood facilitate playing outside, and also some sport facilities seem to be available, although less detail is given regarding them compared to playgrounds.	Benches, playgrounds and outdoor sports facilities

H.2 Sluisbuurt

The Sluisbuurt is a planned neighbourhood with 5,500 houses in Amsterdam, which should stimulate reduced usage of cars. Nonetheless, cars remain having access, although the parking norm is very low (0.3) (Municipality of Amsterdam, 2017).

Table H.2, Attributes of the Sluisbuurt

Attribute	Description	Level
Access for cars	The neighbourhood has two types of streets. A network which is accessible by cars with 30 km/h, and a network where only pedestrians are allowed, and, in case of emergency, emergency services.	Access with 30 km/h
Walking time to parking	Parking is realised in central parking garages. The estimated walking time to these, based on the urban vision and Google Maps is around 4 minutes.	4 minutes
Public transport	At the moment, a bus/tram stop is situated near the location of the neighbourhood. Some new lines might be added in the near future.	Bus and tram
Shared vehicles	Shared car are briefly mentioned in the urban vision. Other forms of shared vehicles are not discussed.	Shared cars
Walking time to public transport and shared vehicles	The distance as the crow flies from the centre of the Sluisbuurt to the nearest bus/tram stop is 520m. The real walking distance will be longer. The urban vision describes that this walking distance is acceptable, due to the high frequency of the tram.	8 minutes
Amenities	A broad range of amenities will be available in the Sluisbuurt, located centrally thus easily accessible by foot within a few minutes. Especially education receives much attention in the urban vision.	Supermarket, primary school, (non) food shops and restaurants
Green	The Sluisbuurt has multiple small parks distributed over the neighbourhood.	Green in the street and multiple small parks
Amenities in public space	Multiple outdoor sports facilities are present, and streets are designed such that they allow sports such as roller skating, cycling and running. A playground will be available.	Benches, playgrounds and outdoor sports facilities

H.3 Schieoevers-North

Schieoevers-North is a planned neighbourhood in Delft. Originally, this was an industrial area, but because of its central location, it is to be transformed into an area with housing and working. The area consists of several sub-projects. This chapter makes use of the ‘Kabeldistrict’, a car-reduced area which has to provide 3,500 houses and 1,250 jobs, close to station Delft Campus (marco.broekman, 2019).

Table H.3, Attributes of Schieoevers-North

Attribute	Description	Level
Access for cars	The neighbourhood is divided in multiple zones. Some focus on working, others on housing, and others a mix of those. Accessibility for cars depends on the zone. Most streets will be designed as ‘shared space’ , in which the car is a guest and has to drive with a low speed (Kabeldistrict, n.d.) Therefore, 5 km/h has been chosen.	Access with 5 km/h
Walking time to parking	Walking distances are, estimated using the urban vision and Google Maps, at most 300m, which is about 4 minutes walking.	4 minutes
Public transport	The primary form of available public transport is the train; this neighbourhood is situated in between two train stations. The part of the neighbourhood featuring most houses is the Kabeldistrict, which is situated close to station Delft Campus. In the future, (autonomous) buses might also connect this neighbourhood with other parts of Delft. As no level is available which only includes a (bus and) train, the level with a bus, tram and train is chosen.	Bus, tram and train
Shared vehicles	The urban vision mentiones shared cars specifically. It remains unclear whether other forms of shared vehicles will be available.	Shared cars
Walking time to public transport and shared vehicles	The walking time from the Kabeldistrict to station Delft Campus is about 8 minutes, but might become lower. The more northern parts of the Schieoevers North have a longer walking time, but another station might be added to improve accessibility by public transport of this part. The walking time to shared vehicles is unclear, but likely less than 8 minutes.	8 minutes

Attribute	Description	Level
Amenities	A broad range of amenities will be available. A supermarket will be available, but this is a small one.	Supermarket, primary school, (non) food shops and restaurants
Green	The neighbourhood features three types of green. 1) a park next to the Schie; 2) pocket parks of at least 400m^2 within 75m of every house, and green within and at buildings. Due to the focus of pocket parks, the level 'Green in the street and multiple small parks' is chosen.	Green in the street and multiple small parks.
Amenities in public space	The urban vision describes that playing at the street, as cars have reduced access, or sporting in the park along the Schie will be possible. However, nothing is stated regarding amenities which facilitate playing (playgrounds) or sports. Therefore, the level 'benches' is chosen, although this might be more negative than the real situation.	Benches

H.4 Merwe-Vierhavens

Merwe-Vierhavens is an area with harbours between Rotterdam and Schiedam. This is to be transformed into an area with housing (3,500-5,000), industry and culture. The neighbourhood focusses on the human, and not on cars. Cars have access to main streets, although they are not the primary user. Next to that, many paths for cyclists and pedestrians will be available (Rotterdam Makers District, 2019; Rotterdam Makers District, 2022)

Table H.4, Attributes of Merwe-Vierhavens

Attribute	Description	Level
Access for cars	Cars have access with 30 km/h to the main streets of the neighbourhood. These streets are shared with cyclists and pedestrians, but it is unclear whether measures are applied to reduce speed and prioritise active modes at these streets, besides not providing parking at the street.	Access with 30 km/h
Walking time to parking	Parking garages are located at a few minutes walking (at most 400m, 5 minutes) from origins/destinations in the neighbourhood.	4 minutes
Public transport	The neighbourhood is served by a tram and metro, at the northern border. Later on, a stop for the waterbus and a small autonomous bus within the area will be added.	Bus and tram
Shared vehicles	Multiple types of shared vehicles will be available. These include cars, bicycles, mopeds and eventually other types.	Shared car and electric (transport) bike
Walking time to public transport and shared vehicles	Throughout the neighbourhood, multiple hubs with shared cars will be available. A walking time of around 4 minutes to these is expected. Walking times to the tram and metro are longer, as these are not through the area itself. Because of this, the level '8 minutes' has been chosen.	8 minutes
Amenities	The area will contain multiple types of shops, even though it is unknown yet whether a supermarket will be available. A primary school will be present in the neighbourhood.	Supermarket, primary school, (non) food shops and restaurants
Green	Merwe-Vierhavens has green throughout the area, and multiple parks, both between blocks and at the head of the pier.	Green in the street and multiple small parks
Amenities in public space	It remains unclear what type of amenities in public space will be available. However, multiple parks should support playing and sporting outside, thus it is likely that facilities will be available.	Benches, playgrounds and outdoor sports facilities

H.5 GWL-terrain

The GWL-terrain in Amsterdam is an already existing car-free neighbourhood. However, this neighbourhood is relatively small with only 600 houses. It is a neighbourhood with a high density of houses, but still a lot of green, especially when compared to surrounding neighbourhoods. This is no surprise as it is developed as a very environmentally friendly neighbourhood (GWL-terrein, n.d.).

Table H.5, Attributes of the GWL-terrain

Attribute	Description	Level
Access for cars	Cars do not have access to this neighbourhood	No access
Walking time to parking	Walking times are low, as the neighbourhood is only 200x700m. A walking time of 4 minutes is used, although this is likely to be on the larger end.	4 minutes
Public transport	The neighbourhood is connected to two bus stops and a tram stop, all with a high frequency.	Bus and tram
Shared vehicles	The website of the neighbourhood (gwl-terrein.nl) does not provide any information about the availability of shared vehicles. However, shared cars are available. Shared electric (transport) bikes seem not to be available yet. (Municipality of Amsterdam, 2022).	Shared cars
Walking time to public transport and shared vehicles	A walking time of 4 minutes is used, although this is likely to be on the larger end.	4 minutes
Amenities	Multiple small shops, a restaurant and a hotel are present. A supermarket and primary school are not present in this neighbourhood, but both close to the neighbourhood (respectively at 8 and 3 minutes walking from the centre of the neighbourhood). No level exists without a supermarket and primary school thus the level with all amenities is chosen.	Supermarket, primary school, (non) food shops and restaurants
Green	The neighbourhood features a lot of green, including communal gardens.	Much green in the street, but no park.
Amenities in public space	This area features multiple benches and at least two playgrounds. No sport facilities are present, which is no surprise since the neighbourhood is relatively small.	Benches and playgrounds

H.6 Nesselande

Nesselande is a VINEX-neighbourhood in the north-east of Rotterdam. Because of its large size, only part of the neighbourhood between the Brandingdijk and Henri Laurenspad has been included.

Table H.6, Attributes of Nesselande

Attribute	Description	Level
Access for cars	Cars have full access with 30 km/h	30 km/h
Walking time to parking	As cars have full access, and can park in every street, the walking time is <1 minute.	<1 minute
Public transport	The neighbourhood is served by a bus and metro. The busses are regional, and have a low frequency (two lines twice/hour/direction). The level bus and tram is used.	Bus and tram
Shared vehicles	Shared cars are available. Whether other shared vehicles are available is unknown.	Shared cars.
Walking time to public transport and shared vehicles	The longest walking time to the nearest bus/tram stop is 10 minutes. When only considering the metro, this increases to 17 minutes. A walking time of 8 minutes has been used. This is around the average expected walking time.	8 minutes
Amenities	The neighbourhood has a small centre with a diverse range of amenities. a primary school is situated elsewhere in the neighbourhood. It should however be noted that these amenities are only on walking distance for a small number of inhabitants of the neighbourhood. Therefore, the level 'supermarket and primary school' has been chosen, as this is the reality for most residents.	Supermarket and primary school.
Green	Nesselande does not contain as much green as neighbourhoods such as the Merwedekanaalzone or Schieoevers-North. This, however, is not only caused by the presence of cars, but probably also by different insights when this neighbourhood was developed, even though the neighbourhood is relatively new. Nonetheless, Nesselande contains trees in all streets and a large park.	Green in the street and one large park
Amenities in public space	Although not as much present as in other planned neighbourhoods, Nesselande contains multiple playgrounds, and a football field in the central park.	Benches, playgrounds and sport facilities

H.7 Leidsche Rijn

Leidsche Rijn is a VINEX-neighbourhood in Utrecht. It has been built close to the train tracks, to make it good accessible by train. This study does not use the entire neighbourhood of Leidsche Rijn: the centre is developed as car-reduced area and differs strongly from the rest of the neighbourhood. The centre has therefore been excluded in the comparison.

Table H.7, Attributes of Leidsche Rijn

Attribute	Description	Level
Access for cars	Cars have full access to most streets with 30 km/h (main roads 50 km/h)	Access with 30 km/h
Walking time to parking	Parking is usually close to someone's house. However, it is not always in front of the door, but sometimes at small parking lots at the rear end of a row houses.	<1 minute
Public transport	Leidsche Rijn is oriented towards the train line Utrecht-Woerden. However, for this part of Leidsche Rijn, the station (Utrecht Terwijde) is further away than specified in the attribute levels for walking time. Next to the train, some bus lines cross this part of Leidsche Rijn. The bus is selected as level.	Bus
Shared vehicles	Shared cars are available. Whether other shared vehicles are available is unknown.	Shared cars.
Walking time to public transport and shared vehicles	The walking time to the bus stops is generally around 8 minutes.	8 minutes
Amenities	This part of Leidsche Rijn does not include a supermarket. Nonetheless, some supermarkets are situated close to this area. Multiple primary schools are available. No other amenities are present.	Supermarket and primary school
Green	Multiple parks are present, as well as green in the street. These parks are larger than small parks in other selected neighbourhoods, but smaller than the large parks. Next to that, they are relatively simple, some of them consist of some grass and pedestrian paths only.	Green in the street and multiple small parks.
Amenities in public space	This neighbourhood contains some playgrounds and outdoor sports facilities. Their density is lower than in other neighbourhoods, but that applies to the houses as well.	Benches, playgrounds and outdoor sports facilities

H.8 IJburg

IJburg is a group of islands at the north-eastern side of Amsterdam. The entire neighbourhood has to provide housing for about 50,000 residents (Municipality of Amsterdam, n.d.). IJburg is not completed yet. In this study, the first phase of IJburg is included, which consists of the islands Steigereiland, Haveneiland and the Rieteilanden.

Table H.8, Attributes of IJburg

Attribute	Description	Level
Access for cars	Cars have access to a large part of the neighbourhood. Although traffic calming measures are applied, a maximum speed of 30 km/h is applied everywhere, except for the main access road which is 50 km/H.	Access with 30 km/h
Walking time to parking	Parking is usually close to home, at the street or in a parking garage.	<1 minute
Public transport	The neighbourhood is served by a frequent tram and bus line (both six/hour/direction).	Bus and tram
Shared vehicles	Shared cars are available. It is unknown whether other types of shared vehicles are available as well.	Shared cars
Walking time to public transport and shared vehicles	The walking time is at most 7 minutes (estimated via Google Maps), but generally shorter. Therefore, a waling time of 4 minutes is chosen.	4 minutes
Amenities	The neighbourhood features multiple primary schools and supermarkets. However, the latter are not at central locations, which results in walking times longer than 5 minutes. Also other (non) food shops and restaurants are available.	Supermarket, primary school, (non) food shops and restaurants
Green	The neighbourhood features multiple small parks. Also, a large park (Diemerpark) is nearby at about 10 minutes walking. The level 'Green in the street and multiple small parks' is selected, as these small parks are much closer, and part of the neighbourhood itself.	Green in the street and multiple small parks
Amenities in public space	Some of the small parks contain a playground and/or a football field. The large park does only contain multiple football fields.	Benches, playgrounds and outdoor sports facilities

H.9 Look-West

Look-West is a VINEX-neighbourhood in Den Hoorn, a village adjacent to the city Delft. Of the selected neighbourhoods, this is a smaller neighbourhood, featuring about 650 houses (Midden Delfland, 2002).

Table H.9, Attributes of Look-West

Attribute	Description	Level
Access for cars	Cars have access with 30 km/H. nonetheless, some roads have a dead end for cars, but continue for pedestrians and cyclists.	Access with 30km/h
Walking time to parking	Cars can be parked in all streets, thereby the walking time is negligible.	<1 minute
Public transport	The neighbourhood is served by a bus with a low frequency (twice/hour/direction).	Bus
Shared vehicles	Even though providers of shared vehicles might be active, no governmental program to provide shared vehicles in Look-West could be found.	Not available
Walking time to public transport and shared vehicles	The walking time is at most 8 minutes, but usually around 5 minutes. However, as the frequency of the busses is low, the higher level of 8 minutes has been used.	8 minutes
Amenities	Only one primary school is available in the neighbourhood. A supermarket is situated close to the neighbourhood, but outside of 5 minutes walking for the larger part of the neighbourhood.	Supermarket and primary school
Green	The neighbourhood has some green, but sometimes this only exists of a few trees in a street. However, the neighbourhood features a lot of water. There are some larger grass fields and water elements, which, are seen as 'park' to be able to describe the neighbourhood in line with the attribute levels.	Green in the street and multiple small parks
Amenities in public space	Multiple playgrounds/outdoor sports facilities are available throughout the neighbourhood.	Benches, playgrounds and sport facilities

H.10 Ypenburg

Ypenburg is a VINEX-neighbourhood near The Hague. It consists of several smaller neighbourhoods. The neighbourhoods 'Singels', 'Waterbuurt' and Morgenweide are used in this study.

Table H.10, Attributes of Ypenburg

Attribute	Description	Level
Access for cars	Cars have access with 30 km/h.	Access with 30 km/h
Walking time to parking	Cars can be parked in all streets, thereby the walking time is negligible.	<1 minute
Public transport	A central tram line crosses the neighbourhood. This is the only form of public transport.	Bus and tram
Shared vehicles	Shared cars are available.	Shared cars
Walking time to public transport and shared vehicles	The walking time to the tram is at most 8 minutes, but on average 4 minutes.	4 minutes
Amenities	The neighbourhood features four primary schools and a small centre with some restaurants and a supermarket. This centre is located at the centre of the neighbourhood, which results in walking times up to 20 minutes, which is long when walking. Therefore, the lowest attribute level (Supermarket and primary school) has been selected, although some other amenities are available as well.	Supermarket and primary school
Green	The neighbourhood has multiple small parks. Streets feature some green (trees), but especially a lot of pavement.	Green in the street and multiple small parks
Amenities in public space	The small parks contains multiple playgrounds and a few outdoor sports facilities (football fields)	Benches, playgrounds and outdoor sports facilities

H.11 Overview of selected attribute levels for car-reduced neighbourhoods

Attribute	Merwedekanaal zone	Sluisbuurt	Schieoevers-North	Merwe-Vierhavens	GWL-terrain
Access for cars	No access	Access with 30 km/h	Access with 5 km/h	Access with 30 km/h	No access
Walking distance to parking from home	4 minutes	4 minutes	4 minutes	4 minutes	4 minutes
Available transport services	Bus	Bus and tram	Bus, tram and train	Bus and tram	Bus and tram
Available shared mobility	Shared car and electric (transport) bike	Shared cars	Shared cars	Shared car and electric (transport) bike	Shared cars
Walking distance to transport services	4 minutes	8 minutes	8 minutes	8 minutes	4 minutes
Amenities within 5 minutes (400m) walking	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants	Supermarket, primary school, (non) food shops and restaurants
Green in the neighbourhood	Green in the street and one large park	Green in the street and multiple small parks	Green in the street and multiple small parks.	Green in the street and multiple small parks	Much green in the street, but no park.
Amenities in public space	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches	Benches, playgrounds and outdoor sports facilities	Benches and playgrounds

H.12 Overview of selected attribute levels for car-included neighbourhoods

Attribute	Nesselande	Leidsche Rijn	IJburg	Look-West	Ypenburg
Access for cars	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h	Access with 30 km/h
Walking distance to parking from home	<1 minute	<1 minute	<1 minute	<1 minute	<1 minute
Available transport services	Bus and tram	Bus	Bus and tram	Bus	Bus and tram
Available shared mobility	Not available	Shared cars.	Shared cars	Not available	Shared cars
Walking distance to transport services	8 minutes	8 minutes	4 minutes	8 minutes	4 minutes
Amenities within 5 minutes (400m) walking	Supermarket and primary school.	Supermarket and primary school	Supermarket, primary school, (non) food shops and restaurants	Supermarket and primary school	Supermarket and primary school
Green in the neighbourhood	Green in the street and one large park	Green in the street and multiple small parks.	Green in the street and multiple small parks	Green in the street and multiple small parks	Green in the street and multiple small parks
Amenities in public space	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and outdoor sports facilities	Benches, playgrounds and sport facilities	Benches, playgrounds and outdoor sports facilities

I. Preferences for real neighbourhoods

The interactions used in the model allow to create profiles of households. This appendix gives an overview of the share of households which would have a preference for each selected neighbourhood, if they had to choose from the set of selected neighbourhoods.

Table I.1, Preferencs for neighbourhoods for persons below the age of 40.

Householdtype						
Age	<40	<40	<40	<40	<40	<40
Education level	High	High	High	High	High	High
Children	No	No	Yes	Yes	Yes	Yes
Children below 12	No	No	No	Yes	No	Yes
Car	No	Yes	No	No	Yes	Yes
Car-reduced neighbourhoods						
Merwedekanaalzone	11.8%	6.6%	13.1%	15.3%	7.2%	8.3%
Sluisbuurt	7.6%	6.3%	8.4%	7.8%	7.0%	6.3%
Schieoevers-North	16.3%	17.6%	9.2%	7.3%	9.9%	7.7%
Merwe-Vierhavens	8.4%	7.0%	9.3%	8.6%	7.7%	7.0%
GWL-terrain	4.9%	2.7%	3.9%	4.6%	2.2%	2.5%
Car-included neighbourhoods:						
Nesselande	5.6%	7.9%	6.2%	6.7%	8.7%	9.2%
Leidsche Rijn	7.2%	10.1%	8.0%	8.7%	11.2%	11.9%
IJburg	11.7%	16.5%	13.0%	14.1%	18.2%	19.3%
Look-West	6.4%	8.9%	7.1%	7.6%	9.9%	10.5%
Ypenburg	7.8%	10.9%	8.6%	9.4%	12.1%	12.8%
Not willing to move	12.3%	5.6%	13.2%	9.9%	6.1%	4.4%

Householdtype						
Age	<40	<40	<40	<40	<40	<40
Education level	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle	Low/middle
Children	No	No	Yes	Yes	Yes	Yes
Children below 12	No	No	No	Yes	No	Yes
Car	No	Yes	No	No	Yes	Yes
Car-reduced neighbourhoods						
Merwedekanaalzone	12.4%	6.8%	13.4%	15.5%	7.3%	8.3%
Sluisbuurt	8.5%	6.9%	9.2%	8.4%	7.5%	6.7%
Schieoevers-North	12.1%	12.8%	6.7%	5.2%	7.1%	5.4%
Merwe-Vierhavens	9.4%	7.7%	10.1%	9.3%	8.3%	7.4%
GWL-terrain	5.5%	3.0%	4.3%	5.0%	2.3%	2.6%
Car-included neighbourhoods:						
Nesselande	6.3%	8.7%	6.8%	7.3%	9.3%	9.8%
Leidsche Rijn	7.6%	10.4%	8.2%	8.8%	11.2%	11.8%
IJburg	13.1%	18.1%	14.2%	15.2%	19.5%	20.5%
Look-West	6.7%	9.2%	7.2%	7.7%	9.9%	10.4%
Ypenburg	8.7%	12.0%	9.4%	10.1%	12.9%	13.6%
Not willing to move	9.9%	4.4%	10.5%	7.8%	4.7%	3.3%

Table I.2, Preferences for neighbourhoods for persons between the age of 40 and 64

Householdtype						
Age	**40-64**	**40-64**	**40-64**	**40-64**	**40-64**	**40-64**
Education level	**High**	**High**	**High**	**High**	**High**	**High**
Children	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Children below 12	**No**	**No**	**No**	**Yes**	**No**	**Yes**
Car	**No**	**Yes**	**No**	**No**	**Yes**	**Yes**
Car-reduced neighbourhoods						
Merwedekanaalzone	9.9%	5.4%	10.7%	12.4%	5.8%	6.6%
Sluisbuurt	9.5%	7.7%	10.3%	9.4%	8.3%	7.5%
Schieoevers-North	11.5%	12.2%	6.4%	5.0%	6.7%	5.1%
Merwe-Vierhavens	10.5%	8.5%	11.3%	10.4%	9.2%	8.2%
GWL-terrain	6.1%	3.3%	4.8%	5.6%	2.6%	2.9%
Car-included neighbourhoods:						
Nesselande	7.0%	9.6%	7.6%	8.1%	10.3%	10.9%
Leidsche Rijn	6.1%	8.3%	6.6%	7.0%	8.9%	9.4%
IJburg	14.7%	20.1%	15.9%	17.0%	21.6%	22.8%
Look-West	5.3%	7.3%	5.8%	6.2%	7.9%	8.3%
Ypenburg	9.7%	13.3%	10.5%	11.3%	14.3%	15.1%
Not willing to move	9.6%	4.2%	10.2%	7.5%	4.5%	3.2%

Householdtype						
Age	**40-64**	**40-64**	**40-64**	**40-64**	**40-64**	**40-64**
Education level	**Low/middle**	**Low/middle**	**Low/middle**	**Low/middle**	**Low/middle**	**Low/middle**
Children	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Children below 12	**No**	**No**	**No**	**Yes**	**No**	**Yes**
Car	**No**	**Yes**	**No**	**No**	**Yes**	**Yes**
Car-reduced neighbourhoods						
Merwedekanaalzone	10.1%	5.4%	10.7%	12.3%	5.7%	6.4%
Sluisbuurt	10.3%	8.3%	11.0%	9.9%	8.7%	7.8%
Schieoevers-North	8.3%	8.6%	4.5%	3.5%	4.6%	3.5%
Merwe-Vierhavens	11.4%	9.1%	12.1%	11.0%	9.6%	8.6%
GWL-terrain	6.7%	3.6%	5.1%	5.9%	2.7%	3.1%
Car-included neighbourhoods:						
Nesselande	7.6%	10.3%	8.1%	8.6%	10.9%	11.4%
Leidsche Rijn	6.2%	8.3%	6.6%	7.0%	8.8%	9.2%
IJburg	15.9%	21.5%	17.0%	18.0%	22.7%	23.8%
Look-West	5.4%	7.3%	5.8%	6.1%	7.8%	8.1%
Ypenburg	10.6%	14.3%	11.3%	12.0%	15.1%	15.8%
Not willing to move	7.6%	3.2%	7.9%	5.8%	3.4%	2.3%

Table I.3, Preferences for neighbourhoods for elderly (65 and older)

Householdtype				
Age	**≥65**	**≥65**	**≥65**	**≥65**
Education level	**High**	**High**	**Low/middle**	**Low/middle**
Children	**No**	**No**	**No**	**No**
Children below 12	**No**	**No**	**No**	**No**
Car	**No**	**Yes**	**No**	**Yes**
Car-reduced neighbourhoods				
Merwedekanaalzone	10.2%	5.5%	10.4%	5.5%
Sluisbuurt	9.8%	7.9%	10.6%	8.4%
Schieoevers-North	10.3%	10.8%	7.4%	7.7%
Merwe-Vierhavens	10.8%	8.7%	11.7%	9.3%
GWL-terrain	4.9%	2.6%	5.3%	2.8%
Car-included neighbourhoods:				
Nesselande	7.2%	9.8%	7.8%	10.5%
Leidsche Rijn	6.3%	8.5%	6.3%	8.5%
IJburg	15.1%	20.6%	16.4%	22.0%
Look-West	5.5%	7.5%	5.6%	7.5%
Ypenburg	10.0%	13.7%	10.9%	14.6%
Not willing to move	9.8%	4.3%	7.7%	3.3%

J. Survey

J.1 Introduction

Beste deelnemer,

Wat vindt u belangrijk als u kiest waar u gaat wonen? Dat de auto dichtbij staat, de buurt groen is, dat winkels dichtbij zijn, of dit allemaal? Namens de TU Delft en Advies- en Ingenieursbureau Arcadis onderzoek ik het verband tussen persoonlijke kenmerken van mensen en hun voorkeuren voor reizen en wonen. Dit doe ik voor de afronding van mijn master. Doet u mee aan deze vragenlijst, dan maakt u kans op een van de Bol.com-bonnen van €10 (6x) en €20 (2x). Het invullen van deze lijst duurt ongeveer 10 minuten.

Welke gegevens worden er gevraagd?
In deze vragenlijst wordt gevraagd naar verschillende persoonlijke gegevens, zoals uw postcode, leeftijd en inkomen. U kunt ervoor kiezen om deze gegevens niet te delen. Alleen gegevens die u geeft worden bewaard; uw IP-adres wordt niet opgeslagen. Wilt u kans maken op een Bol.com-bon, of heeft u interesse in de resultaten van dit onderzoek, vul dan ook uw e-mailadres in waar daarom gevraagd wordt.

Hoe worden uw antwoorden opgeslagen?
Uw antwoorden worden beveiligd opgeslagen, in lijn met de AVG. Ondanks alle zorgvuldigheid blijft er altijd een risico op een datalek bestaan. E-mailadressen worden verwijderd wanneer dit onderzoek klaar is. Daarna zijn alle antwoorden anoniem. Geeft u uw e-mailadres niet? Dan worden uw antwoorden al direct anoniem opgeslagen. Na afloop van dit onderzoek blijven de anonieme antwoorden beschikbaar voor verdere onderzoeken.

Toestemming
Door verder te gaan met deze vragenlijst geeft u toestemming voor het opslaan en verwerken van uw antwoorden. Daarnaast verklaart u dat u minimaal 18 jaar bent. Besluit u tussendoor dat u toch niet deel wilt nemen, dan kunt u de vragenlijst sluiten en worden uw antwoorden niet opgeslagen.

Opmerkingen of vragen?
Heeft u vragen of opmerkingen, neem dan gerust contact met mij op.

Alvast bedankt voor het invullen!

Gerben Andringa
gerben.andringa@arcadis.com

J.2 Vragen transportgedrag

Q2.1 Hoeveel auto's zijn er in uw huishouden?

- 0 auto's
- 1 auto
- 2 auto's
- Meer dan 2 auto's

Q2.2 Verwacht u binnen een jaar een auto weg te doen, zonder deze te vervangen door een nieuwe?
Only if Q2.1≥ 1

- Ja
- Nee
- Misschien

Q2.3a Verwacht u binnen een jaar een auto te kopen?
Only if Q2.1 = 0

- Ja
- Nee
- Misschien

Q2.3b Verwacht u binnen een jaar een extra auto te kopen?
Only if Q2.1≥1

- Ja
- Nee
- Misschien

Q2.4 Hoe lang moet u lopen van huis naar uw geparkeerde auto?
Only if Q2.1≥ 1

- Minder dan 1 minuut
- 1-4 minuten
- 4-8 minuten
- Meer dan 8 minuten

Q2.5 Hoe vaak maakt u gebruik van de volgende vervoermiddelen?

	5 of meer dagen per week	1-4 dagen per week	1-3 dagen per maand	Minder dan 1 dag per maand	Niet
Lopen	0	0	0	0	0
Fiets	0	0	0	0	0
Auto	0	0	0	0	0
Trein	0	0	0	0	0
Bus/Tram/Metro	0	0	0	0	0
Deelauto	0	0	0	0	0
Deelfiets/-scooter	0	0	0	0	0

Q2.6 Welk vervoersmiddel heeft uw voorkeur als u naar een van de volgende bestemmingen gaat? Stel dat u meerdere vervoersmiddelen gebruikt, kiest u dan die waarmee u de langste afstand aflegt.

	Lopen	**Fiets**	**Auto**	**Trein**	**Bus/Tram/Metro**	**Deelauto**	**Deelfiets/-scooter**	**N.v.t.**
Werk	0	0	0	0	0	0		0
School/studie	0	0	0	0	0	0		0
Supermarkt Dagelijkse boodschappen	0	0	0	0	0	0		0
Winkelcentrum	0	0	0	0	0	0		0
Horeca	0	0	0	0	0	0		0
Sport en vrije tijd	0	0	0	0	0	0		0

Q2.7 Verwacht u te verhuizen binnen 5 jaar?

- Ja, binnen 1 jaar
- Ja, over 1-3 jaar
- Ja, over 3-5 jaar
- Nee, ik verwacht niet te verhuizen binnen 5 jaar
- Weet niet

Q2.8 Wat voor soort woning heeft uw voorkeur?

- Vrijstaande woning
- Twee-onder-een-kapwoning
- Woning in een rij woningen
- Hoekwoning
- Appartement in gebouw met maximaal 5 verdiepingen
- Appartement in gebouw met meer dan 5 verdiepingen
- Anders

Q2.9 Wat voor woonomgeving heeft uw voorkeur?

- Centrum van een stad

J.3 Stellingen

Bent u het eens of oneens met de volgende stellingen?

		Helemaal eens	Eens	Niet eens/oneens	Oneens	Helemaal oneens
1	De auto geeft mij een gevoel van vrijheid	0	0	0	0	0
2	Ik gebruik de auto Only if het echt nodig is	0	0	0	0	0
3	Ik zou alleen verhuizen naar een woning waar mijn auto direct bij kan staan	0	0	0	0	0
4	Ik woon graag in een wijk met weinig auto's op straat	0	0	0	0	0
5	Ik vind het belangrijk dat er veel groen is in mijn woonomgeving	0	0	0	0	0
6	Ik vind het fijn om een divers aanbod aan voorzieningen in mijn wijk te hebben.	0	0	0	0	0
7	Als parkeerplaatsen dicht bij mijn huis worden veranderd in groen zou ik waarschijnlijk verhuizen	0	0	0	0	0

Statements 3 and 7 are used as filter questions. Persons who strongly agree with at least one of them will exit the survey.

J.4 Keuze-experiment

Qualtrics determines automatically which block is shown to which respondent. This is randomly distributed, but such that the number of respondents per block is similar.

J.4.1 Block 1

Explanation and example

In de volgende negen vragen krijgt u steeds twee wijken te zien naast elkaar. Hieronder ziet u een voorbeeld. Bij deze wijken worden steeds enkele vragen gesteld.

Houdt u hierbij de volgende dingen in gedachten:

- U kunt wonen in de woning van uw voorkeur.
- Hulpdiensten hebben altijd toegang tot de wijJ.
- Invaliden kunnen altijd dicht bij hun huis parkeren.
- In sommige wijken moet u enkele minuten lopen naar de parkeerplaats, maar is de auto wel toegestaan in de straat. U kunt dan niet parkeren in de straat, maar wel kort stoppen voor laden en lossen.
- Bij OV kunt u ervanuit gaan dat er minimaal 4x/uur een bus/tram/trein (sprinter) vertrekt en u hiermee binnen 10-15 minuten op een intercitystation bent
- Als er deelvervoer in de wijk wordt aangeboden, kunt u dit gebruiken wanneer het u uitkomt.

Example (Composed from choice-set 2.1, neighbourhood 2 en choice-set 2.2 neighbourhood 2)

	Wijk 1	**Wijk 2**
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes, speeltuinen en mogelijkheden om te sporten

Choice-set 1.1

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Geen toegang
Looptijd tot parkeerplaats	8 min lopen (600m)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus	Bus
Beschikbaar deelvervoer	Deelauto's	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	4 min lopen (300m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.2

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Geen toegang
Looptijd tot parkeerplaats	4 min lopen (300m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus en tram	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's	Geen deelvervoer
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en meerdere kleine parken	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.3

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 30 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus	Bus
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Geen deelvervoer
Looptijd tot OV en deelvervoer	4 min lopen (300m)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en meerdere kleine parken	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.4

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Geen toegang
Looptijd tot parkeerplaats	8 min lopen (600m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	8 min lopen (600m)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en meerdere kleine parken	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.5

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus en tram
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	4 min lopen (300m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.6

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus en tram	Bus, tram en trein
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's
Looptijd tot OV en deelvervoer	8 min lopen (600m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en een groot park	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.7

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Geen toegang
Looptijd tot parkeerplaats	4 min lopen (300m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus en tram
Beschikbaar deelvervoer	Deelauto's	Deelauto's
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt en basisschool
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.8

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	8 min lopen (600m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 1.9

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus en tram	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

J.4.2 Block 2

Explanation and example

In de volgende negen vragen krijgt u steeds twee wijken te zien naast elkaar. Hieronder ziet u een voorbeeld. In iedere vraag wordt gevraagd welke wijk uw voorkeur heeft. Denkt u zich hierbij in dat de woning van uw voorkeur beschikbaar is.

Example (composed from choice-set 1.3, neighbourhood 1 en choice-set 3.4 neighbourhood 1)

	Wijk 1	**Wijk 2**
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	4 min lopen (300m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en meerdere kleine parken	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- o Wijk 1
- o Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- o Ja
- o Nee

In wijk 2 mogen auto's niet voor de deur parkeren, maar ze mogen wel stapvoets door de straat rijden. Hierbij kunt u uw voordeur bereiken met de auto, bijvoorbeeld om boodschappen uit te laden, waarna u uw auto verderweg parkeert.

Bij OV kunt u ervanuit gaan dat er minimaal 4x/uur een bus/tram/trein vertrekt en u binnen 10-15 minuten op een intercitystation bent. Als deelvervoer in de wijk wordt aangeboden, kunt u dit gebruiken wanneer het u uitkomt.

Houdt u hiernaast de volgende punten in gedachten:

- Hulpdiensten hebben altijd toegang tot de straat
- Invaliden kunnen altijd in de buurt parkeren

Choice-set 2.1

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Geen toegang
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus	Bus, tram en trein
Beschikbaar deelvervoer	Geen deelvervoer	Geen deelvervoer
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en meerdere kleine parken	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.2

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus en tram	Bus
Beschikbaar deelvervoer	Deelauto's	Deelauto's
Looptijd tot OV en deelvervoer	4 min lopen (300m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.3

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 30 km/h
Looptijd tot parkeerplaats	4 min lopen (300m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus	Bus
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Geen deelvervoer
Looptijd tot OV en deelvervoer	8 min lopen (600m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.4

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus en tram
Beschikbaar deelvervoer	Geen deelvervoer	Geen deelvervoer
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.5

	Wijk 1	**Wijk 2**
Toegang voor auto's	Toegang met 5 km/h	Geen toegang
Looptijd tot parkeerplaats	4 min lopen (300m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus en tram
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's
Looptijd tot OV en deelvervoer	8 min lopen (600m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.6

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus en tram	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- o Wijk 1
- o Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- o Ja
- o Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- o Heel waarschijnlijk
- o Waarschijnlijk
- o Niet waarschijnlijk/onwaarschijnlijk
- o Onwaarschijnlijk
- o Heel onwaarschijnlijk

Choice-set 2.7

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Geen toegang
Looptijd tot parkeerplaats	4 min lopen (300m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's	Geen deelvervoer
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- o Wijk 1
- o Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.8

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Geen deelvervoer
Looptijd tot OV en deelvervoer	8 min lopen (600m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt en basisschool
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 2.9

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus	Bus en tram
Beschikbaar deelvervoer	Deelauto's	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	8 min lopen (600m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Groen in de straat en meerdere kleine parken	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

J.4.3 Block 3

Explanation and example

In de volgende negen vragen krijgt u steeds twee wijken te zien naast elkaar. Hieronder ziet u een voorbeeld. In iedere vraag wordt gevraagd welke wijk uw voorkeur heeft. Denkt u zich hierbij in dat de woning van uw voorkeur beschikbaar is.

Example (composed of choice-set 2.1, neighbourhood 2 and choice-set 2.2 neighbourhood 2)

	Wijk 1	**Wijk 2**
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt,basisschool, (non-) food winkels horeca	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- o Wijk 1
- o Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- o Ja
- o Nee

In wijk 2 mogen auto's niet voor de deur parkeren, maar ze mogen wel stapvoets door de straat rijden. Hierbij kunt u uw voordeur bereiken met de auto, bijvoorbeeld om boodschappen uit te laden, waarna u uw auto verderweg parkeert.

Bij OV kunt u ervanuit gaan dat er minimaal 4x/uur een bus/tram/trein vertrekt en u binnen 10-15 minuten op een intercitystation bent. Als deelvervoer in de wijk wordt aangeboden, kunt u dit gebruiken wanneer het u uitkomt.

Houdt u hiernaast de volgende punten in gedachten:

- Hulpdiensten hebben altijd toegang tot de straat
- Invaliden kunnen altijd in de buurt parkeren

Choice-set 3.1

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 5 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	4 min lopen (300m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en meerdere kleine parken	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.2

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Geen toegang
Looptijd tot parkeerplaats	4 min lopen (300m)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus en tram	Bus en tram
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's
Looptijd tot OV en deelvervoer	8 min lopen (600m)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en meerdere kleine parken	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.3

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 30 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus en tram	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's
Looptijd tot OV en deelvervoer	4 min lopen (300m)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt en basisschool
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en een groot park
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.4

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 5 km/h	Geen toegang
Looptijd tot parkeerplaats	8 min lopen (600m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en meerdere kleine parken	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.5

	Wijk 1	**Wijk 2**
Toegang voor auto's	Toegang met 5 km/h	Toegang met 5 km/h
Looptijd tot parkeerplaats	4 min lopen (300m)	8 min lopen (600m)
Beschikbaar openbaar vervoer	Bus en tram	Bus
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's
Looptijd tot OV en deelvervoer	4 min lopen (300m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Groen in de straat en meerdere kleine parken	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.6

	Wijk 1	Wijk 2
Toegang voor auto's	Toegang met 30 km/h	Toegang met 5 km/h
Looptijd tot parkeerplaats	4 min lopen (300m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus	Bus en tram
Beschikbaar deelvervoer	Geen deelvervoer	Geen deelvervoer
Looptijd tot OV en deelvervoer	4 min lopen (300m)	4 min lopen (300m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt en basisschool
Groen in de wijk	Groen in de straat en een groot park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.7

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	<1 min (auto dicht bij huis)	<1 min (auto dicht bij huis)
Beschikbaar openbaar vervoer	Bus en tram	Bus en tram
Beschikbaar deelvervoer	Deelauto's	Geen deelvervoer
Looptijd tot OV en deelvervoer	8 min lopen (600m)	<1 min (dicht bij huis)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool, (non-) food winkels en horeca	Supermarkt, basisschool en (non-) food winkels
Groen in de wijk	Veel groen in de straat, maar geen park	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes	Bankjes en speeltuinen

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.8

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 5 km/h
Looptijd tot parkeerplaats	8 min lopen (600m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus	Bus, tram en trein
Beschikbaar deelvervoer	Deelauto's en elektrische (bak)fietsen	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	<1 min (dicht bij huis)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt en basisschool	Supermarkt en basisschool
Groen in de wijk	Veel groen in de straat, maar geen park	Veel groen in de straat, maar geen park
Voorzieningen buiten	Bankjes en speeltuinen	Bankjes

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

Choice-set 3.9

	Wijk 1	Wijk 2
Toegang voor auto's	Geen toegang	Toegang met 30 km/h
Looptijd tot parkeerplaats	4 min lopen (300m)	4 min lopen (300m)
Beschikbaar openbaar vervoer	Bus, tram en trein	Bus en tram
Beschikbaar deelvervoer	Geen deelvervoer	Deelauto's en elektrische (bak)fietsen
Looptijd tot OV en deelvervoer	4 min lopen (300m)	8 min lopen (600m)
Voorzieningen binnen 5 minuten lopen	Supermarkt, basisschool en (non-) food winkels	Supermarkt, basisschool, (non-) food winkels en horeca
Groen in de wijk	Veel groen in de straat, maar geen park	Groen in de straat en meerdere kleine parken
Voorzieningen buiten	Bankjes, speeltuinen en mogelijkheden om te sporten	Bankjes, speeltuinen en mogelijkheden om te sporten

Welke wijk heeft uw voorkeur?

- Wijk 1
- Wijk 2

Zou u in de door u gekozen wijk willen wonen?

- Ja
- Nee

Als u naar deze wijk verhuist, hoe waarschijnlijk is het dat u uw auto weg doet?
Only if Q2.1≥1

- Heel waarschijnlijk
- Waarschijnlijk
- Niet waarschijnlijk/onwaarschijnlijk
- Onwaarschijnlijk
- Heel onwaarschijnlijk

J.5 Socio-demographic data

Q8.1 Wat is uw geboortejaar?

Respondent vult geboortejaar in in veld.

Q8.2 Wat is uw geslacht?

- Man
- Vrouw
- Anders
- Wens ik niet te zeggen

Q8.3 Wat zijn de vier cijfers van uw postcode?

- *Respondent vult cijfers in in veld.*
- Wens ik niet te zeggen

Q8.4 Wat is uw woonplaats?
Only if Q8.3 = wens ik niet te zeggen

Respondent vult woonplaats in

- Wil niet zeggen

Q8.5 Hoe is uw huishouden samengesteld?

- Alleenstaand zonder thuiswonende kinderen
- Alleenstaand met thuiswonende kinderen
- Gehuwd/samenwonend zonder thuiswonende kind(eren)
- Gehuwd/samenwonend met thuiswonende kind(eren)
- Anders

Q8.6 Hoeveel van de thuiswonende kinderen zijn jonger dan 12 jaar?
Only if Q7.5 = alleenstaand of gehuwd/samenwonend met thuiswonende kinderen

- 0
- 1
- 2
- 3 of meer

Q8.7 Wat is uw hoogst afgeronde opleiding?

- Geen onderwijs
- Basisonderwijs
- VMBO, HAVO- of VWO-onderbouw, MBO1
- HAVO, VWO of MBO 2-4
- HBO of WO-Bachelor
- WO-Master of Doctoraal
- Weet niet

Q8.8 Welke situatie is het meest op u van toepassing?

- Werkend (zelfstandig ondernemer of in loondienst)
- Werkloos
- Gepensioneerd
- Studerend/schoolgaand (inclusief stage)
- Overig
- Weet niet/wil niet zeggen

Q8.8 Wat is het jaarlijkse netto-inkomen van uw huishouden?

- Minder dan €10.000
- €10.000-20.000
- €20.000-30.000
- €30.000-40.000
- €40.000-50.000
- €50.000-60.000
- €60.000-70.000
- €70.000-80.000
- €80.000-90.000
- €90.000-100.000
- Meer dan €100.000

J.6 Closure

Wilt u kans maken op …, vult u dan hieronder uw e-mailadres in. Deze wordt bewaard tot de winnaars zijn bepaald.

Wilt u later meer informatie ontvangen over de resultaten van dit onderzoek? Vult u dan hieronder uw e-mailadres in. Deze wordt bewaard t/m het einde van dit onderzoeJ.

Klikt u op … om de vragenlijst te verzenden.

Bedankt voor het invullen van deze vragenlijst!