The Involvement of Demographics Within The 15-Minute City

Research addressing the inclusion of demographics and design standards with the 15-Minute City concept, and its contribution to the allocation of amenities in Woensel West Eindhoven.

by

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Preface

Dear reader,

After writing this thesis, my study period of 10 years has come to an end, I studied 4 years of structural engineering at Secondary vocational education (MBO in Dutch), a 4-years Bachelor of Urban Planning at University of Applied Sciences (HBO in Dutch), a premaster of 1 year, and a 1-year Master Human Geography at Radboud University Nijmegen, where I may conclude the Master with this thesis. Looking back on this study path, I am grateful and proud to have gained these life experiences and seeing the Dutch educational system on different levels, acquiring different skills, and academic knowledge. I am grateful the people I have met and the inspiring lectures I have been able to attend. Passing this course is one of the biggest events in my life so far, for which I am very grateful, happy, and proud. This is because 10 years ago, I never thought I would be pursuing a master's degree.

I would like to thank my girlfriend and parents for their endless support during this period when the process was not always easy. I would also like to thank my supervisor Prof. Dr. Arnoud Lagendijk for his time, insightful and accurate feedback during this period on my thesis, but also for the facilitation of supervision during the process individually and in groups with my peers and colleagues. Without them, the thesis would never have become what it is today. This also applies to my second reader Martin van der Velde, whose supervision was accurate and for that I am grateful. I also want to thank internship supervisors Sylvia van Haeff and Anneke Coolen of the municipality of Eindhoven, for providing me with this opportunity to write my master's thesis at this organisation. I also thank them for the many opportunities and freedom they offered during this internship period and the help I received during the execution of my master's thesis. Finally, I would like to thank the interviewees, and respondents of the survey for their accesibility and willingness to contribute to this thesis with their insights and my graduation. Since the better world starts with yourself, working on this topic has been motivational.

This motivation will also form the basis for where I will focus myself in the field, namely on the sustainable and liveable development of cities to contribute to the challenges of the 21st century.

Summary

Municipalities struggle with the sustainable development of cities when population growth is high and providing sufficient amenities to meet these population needs. Therefore, Carlos Moreno's theory of the 15-minute city (2021) offers a potential solution by ensuring that all necessary amenities are within a 15-minute walking or cycling distance from every home and eliminating the inconvenience of distance. The 15-minute city aims at the sustainable development of cities, where amenities are accessible to everyone, thus reducing spatial and social inequalities.

However, implementing the 15-minute city concept is not straightforward due to a lack of demographic data, design standards, and accessibility scores. This makes it difficult to determine where and to what extent amenities should be provided and leading to potentially increased inequality. To address this issue, this research focuses on incorporating demographic information and design standards into the 15-minute city concept and examining its impact on amenity allocation specifically in Woensel West. The main question of this study is: 'What is the effect of including demographics and design standards in the 15-minute city to allocating amenities in Woensel West?' In additon to that, hypothesis also have been drawn up: H1: 'The length of time someone lives in Woensel West affects the accessibility of the amenities within 15-minute walking and cycling distance' and H1a: 'There is a difference in the amenity accessibility between residents of social rented housing, compared to residents of private sector housing'.

The 15-minute city concept is explored in a case study of the Woensel West neighbourhood in Eindhoven. The study assessed the demographics and design standards of the neighbourhood, conducted expert interviews, and surveyed the population. The survey results were analysed using the Pearsons' Chi-Squared test with SPSS. The population's satisfaction with the presence and accessibility of amenities, as well as their amenity needs within walking and cycling distance, were assessed. The findings indicated that there were a significant number of amenities within walking and cycling distance. However, there were disparities in accessibility and satisfaction with these amenities. Especially certain amenities that have a high demand and simulaniously have lower levels of satisfaction and accessibility. This reveales a certain prioritisation of amenities that could potentially decrease spatial and social inequality and promote sustainable urban development. Based on these results, it can be concluded that demographics and design standards are an essential contribution to the 15-minute city theory to reinforce the benefits of the concept.

The research findings suggest that demographics, design standards, accessibility, satisfaction rates, and needs play a crucial role in placing amenities in a fair and efficient manner. Especially because it is essential to determine the suitable location and extent of amenities based on these factors. Additionally, the research emphasises the importance of certain amenities to meet the current and future needs of the population. Also, this research and its methods can be applied in other neighbourhoods. Finally, this study has some limitations, including a 90% confidence margin, and insufficient evidence for many calculations concerning some target groups. Suggestions for future research include conducting the Fishers' Test, or by collecting more respondents within the target groups. Moreover, the study did not consider the aspects of "living" and "working" in the context of the 15-minute city due to conceptual and practical limitations, thus implying the need for further research on the conceptualisation of these terms within the 15-minute city framework.

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Key Concepts

The 15-minute city	A concept found by Moreno in 2015, in which essential amenities are available within 15 minutes of walking or cycling distance.
Amenities	Amenities are places that provide space for service, examples are employment, education, healthcare, retail, and fresh and healthy food outlets all interwoven with cycling, walking and public transport access. When amenities are steps away from residents, it encourages them to engage in physical activity, community interaction and social connection (University of Toronto, 2021). When community amenities are steps away from residents, it encourages them to engage in physical activity, community interaction and social connection. Some cities have pursued the goal of the 15-minute city, which aims for each resident to access everything they need within 15 minutes from their house (University of Toronto, 2021).
Inclusiveness	Inclusiveness, or inclusive area development is (a development of) an area in which everyone can participate, despite background, interests, possibilities, and identity.
Living environment	The living environment is defined here as an assembly of the natural and built environment which is offered to the inhabitants of the place who perform various kinds of social, cultural, religious, economic, and political activities which induce peculiarities in the character of the living environment (Tiwari et al., 2015). The living environment is created by combining the influence of these activities and is constantly undergoing change due to the continual evolution of these interlinked activities happening over time and space (Tiwari et al., 2015).
Liveability	Liveability is a term which varies per context, following Tennakoon and Kulatunga (2019). In urbanisation it is often meant as the degree to which a place is suitable or good for living in (Cambridge Dictionary, 2023). It entails safety, and stability, quality of life, amenities, public transport, infrastructure, so it is defined by tangible and intangible indicators (Tennakoon and Kaluntunga, 2019).
Design standards	Standards are used for urban planning based on demographic information, with the goal to supply sufficient amenities according to the market.
Demographics	This variable is defined as the number of people who live in a particular area or form a particular group, especially concerning their age, how much money they have and what they spend it on. Demography as a scientific field studies population characteristics, composition, and development (Cambridge Dictionary, 2024)
Needs	Wanting or needing to use a particular amenity by the user/ inhabitant
Accessibility	The ability to make use of an amenity

1. Introduction

This chapter introduces the basis of the master thesis, which is about addressing the inclusion of demographics and design standards in the 15-Minute City and its contribution to the allocation of amenities. This chapter elaborates on the societal and scientific circumstances and the relevance of this research.

1.1. Background

The liveability of a city is a determining factor in making and keeping the city attractive for inhabitants, students, visitors, and businesses to settle and develop there (PBL, 2015; CBS, 2011; PricewaterhouseCoopers, 2020). According to the literature, amenities play a huge part in keeping and enhancing this attractiveness for these stakeholders, as amenities provide a higher quality of the living environment, thereby improving its liveability (Glaeser et al. 2001; CPB, 2015). Likewise, it turns out that nine out of ten adults who are satisfied with their home or living environment are satisfied with life (CBS, 2018).

Therefore, the physical living environment has an impact on the satisfaction of its inhabitants (Moreno, 2021; Kamphuis et al., 2014; Schultz-Zuidgeest 2021). However, the living environment will be put to the test in the time to come. Especially because the Netherlands currently faces the task of building 981.000 new homes by 2040, and cities struggle to maintain their amenity levels in times of growth, which affects the liveability of cities (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023; Ministerie van Algemene Zaken, 2023; PBL, 2019; Bokern 2023). Of this amount, the municipality of Eindhoven is facing the challenge of accommodating 40.000 new dwellings, and 70.000 inhabitants. The municipality therefore wants to facilitate this growth in a sustainable and liveable manner addressing the social-, economic-, and ecologic dimensions of sustainability (MER, 2023; Gemeente Eindhoven et al., 2020; Gemeente Eindhoven et al., 2024; Provincie Noord Brabant, 2020). One way of doing this, is by situating amenities, as these are essential for the creation, maintenance and strengthening of the city's sustainability (Nijhof, 2010; PBL,2015; Pbl, 2018; CBS, 2019; Schultz-Zuidgeest, 2021; De Mug, 2022). Hence, to manage this growth, it is important to meet the communal needs by providing enough, and the right amenities within the city and its neighbourhoods (Nijhof, 2010; PBL,2015; Pbl, 2018; CBS, 2019; Schultz-Zuidgeest, 2021; Moreno et al., 2021). To attain these goals, special attention is being given to the so-called 'Krachtwijken' in Dutch, or 'neighbourhoods of strength' in Eindhoven. These neighbourhoods have specific issues regarding liveability. As amenities play a huge role in the liveability of a neighbourhood and come under pressure in times of growth according to Bokern (2022), the local community is also necessary to consider when allocating amenities, especially if a large housing task is situated (Jane Jacobs, 1992; David Sim, and Jan Gehl 2019).

According to the literature, the "15-minute city" could make an important contribution to aid the liveability challenges in cities (Moreno et al., 2021; Wu & Divigalpitiya, 2023; Reza Khavarian-Garmsir et al., 2023). This concept was introduced during the Paris Agreement conference in 2015 by Carlos Moreno. He aims to improve residents' quality of life, and create self-sufficient and sustainable neighbourhoods with a focus on the proximity of essential amenities, overcoming the inconveniences brought by distance, especially for the elderly, or the financially disadvantaged who cannot afford (public) transportation. Moreover, the concept aims to create strong communities, by decentralising urban amenities aiming for inclusive growth (Moreno et al., 2021; Wu & Divigalpitiya, 2023; Reza Khavarian-Garmsir et al., 2023). While I appreciate the concept and its goals, it is important to remain critical of the conditions under which the 15-minute city is implemented in urban areas, to what extent is this concept truly inclusive? Despite its sustainable contribution to cities, it does not include demographics according to critics in the literature. Including demographics in the 15-minute concept could strengthen sustainable contributions and minimise negative externalities while allocating amenities (Casarin et al., 2023; Reza Khavarian-Garmsir et al. 2023). Therefore, this research will test the inclusion of demographics and design standards to the 15-minute concept in a specific area.

1.2. Societal Relevance

A liveable city not only attracts new visitors and businesses but also reduces vacancies and enhances local liveability among inhabitants (Bokern, 2022; De Mug, 2022; Vosjan et al., 2019). It therefore requires a deep understanding of human needs to (re)vitalize urban areas sustainably, according to Jane Jacobs, (1992), David Sim, and Jan Gehl (2019). Moreover, failure to seamlessly integrate societal needs may lead to a decline in liveability (Bokern et al., 2022; CBS, 2018; Nijhof, 2010; Schultz-Zuidgeest, 2021; De Mug, 2022; Van den Berg & Kok, 2021; Vosjan et al., 2019). Simultaneously, it is a complex puzzle to solve for municipalities aiming to enhance the living environment, placemakers envisioning vibrant ground-level spaces, and investors seeking sound investments to facilitate sufficient amenities according to all needs (Bokern et al., 2022). To make this happen properly, municipalities are responsible for managing the development of the current situation, and of its future.

As Moreno et al. (2021), and Reza Khavarian-Garmsir et al. (2023) claim that the 15-minute city theory contributes to liveability and all the dimensions of sustainability, it is worth investigating this theory and its potential within the city of Eindhoven. Currently, there are two struggles as examples that press the relevance of the inclusion of demographics to the 15-minute concept and its application. First, Van der Stee & Schelfaut, (2021) claim that relatively more people in the Netherlands prefer to shop close to home rather than in city centres. However, the majority still prefer shopping in city centres, but it has been a growing trend since the end of the COVID-19 pandemic (Van der Stee & Schelfaut, 2021). Therefore, this may be a reason for policymakers of the municipality to act upon, as this demographic trend makes sure it affects the city's amenities and thereby its economy.

Second, some amenities may not be accessible to everyone in their neighbourhood. At least a third of doctors in Eindhoven are facing a patient freeze, as doctors are under great pressure, due to shortages in the healthcare sector on the one hand and struggling to provide care to the current population on the other (Studio040, 2020). In addition, the upcoming growth has yet to be foreseen with the current tightness and doctors are worried, according to the chairman of Stroomz, which has 200,000 patients (Van Son & Triki, 2023). This growth consists mainly of international workers coming to work in the region for companies like ASML and suppliers in the tech sector (Studio040, 2020; Van Son & Triki, 2023). Therefore, within this study, the accessibility of the amenities will be investigated in Woensel West, according to the 15-minute city and by the inclusion of demographics.

1.3. Scientific Relevance

Many initiatives are dedicated to helping cities become more resilient to the ecological, social, and economic challenges that current society faces (Fonseca et al., 2018). The concept of the 15-minute city is a new theory for achieving cities addressing social, ecological, and economic dimensions of sustainable development of the city (Lu & Diab, 2023; Moreno et al., 2021; Wu & Divigalpitiya, 2023; Fonseca et al., 2018). Researchers indicate that geographers should analyse the complex social dimension of urban spaces and emphasise the importance of creating urban environments that are conducive to community engagement and its liveability (Medayese et al., 2021; Nikolov, 2020; Yang et al., 2021). The scientific relevance of this research for this concept is interesting for multiple reasons.

First, not many scientific studies have been done on the specific concept as it is a new theory since 2015 (De Maat, 2021). Second, the 15-minute city pattern is based on a one-size-fits-all approach, and despite being a sustainable concept, it can ensure inclusion and engage marginalised groups, but conversely, it also has a risk of increasing inequality (Casarin et al., 2023). Third, the concept gives little attention to demographics and social needs, which is essential to engage the local population of neighbourhoods (Carlino & Sáiz, 2008; Reza Khavarian-Garmsir et al. 2023). Planners and policymakers at both the national and local levels must deal with demographic changes that shape demands for urban built and social environments. Planning policies and practices do not always respond

quickly to demographic change and urban landscapes therefore often fail to meet the needs of their inhabitants (Laws, 2013). Therefore, contextual research is needed to address these needs.

Furthermore, each community requires a neighbourhood development plan that considers geographic specificities and its unique issues, of which demographics and social needs are examples (Reza Khavarian-Garmsir et al. 2023). Hence, it can be suggested that the 15-minute city on itself is currently more of a top-down approach in this regard. Long-term value can be added by a bottom-up approach to neighbourhood planning to revitalise these areas and develop them for current and future needs (PBL, 2010; Papadopoulos et al., 2023). Adding demographic information and investigating social needs from the neighbourhood itself could therefore be a possible improvement, which is essential to examine as a gap in the literature.

Likewise, Reza Khavarian-Garmsir et al. (2023) indicate that an empirical study is needed about the application of the concept both in developed and developing countries because it will lead to a clearer understanding of the practical barriers, shortages, and feasibility of the concept. Therefore, this thesis outcome contributes to the improvement of the liveability of neighbourhoods, neighbourhoods, and cities, by addressing demographics, as part of situating amenities based on local needs.

1.4. Research Objective

As cities rely on maintaining their amenities, which significantly contribute to the city's sustainable contribution to the city, addressing its social, ecological and economic contribution, this study aims to explore the relationship between the 15-minute city, the allocation of amenities and the inclusion of demographics. According to this goal, this study explores the allocation of amenities in Woensel West, a neighbourhood in Eindhoven as a case study. This neighbourhood was chosen as it has heightened liveability challenges and has a lot of amenities within 15 minutes of walking-, and cycling distance.

Therefore, this research involves investigating the concept by literature, also the neighbourhood whether it complies with the 15-minute city and to what extent the neighbourhood complies with the concept. Simultaneously, the neighbourhood is investigated to the extent the demography of Woensel West affects the supply of amenities, affecting the 15-minute concept, and the neighbourhood. With this research, the goal is to contribute to the existing literature, allow future research to build on it even further and allow future 15-minute cities to incorporate demographics into city planning and strategy.

As a result, it could enhance the sustainable contributions that the literature claims for everyone, in which it situates socially strong, vibrant, and sustainable neighbourhoods, with less inequality among less presented groups and emphasising the importance of bottom-up initiatives. This research is mainly based on the current time, and swiftly about 2040, as the policies and challenges of the municipality are based on this year, and the population growth affects the amenity structure.

1.5. Research Question

To achieve the objective described above, certain knowledge needs to be gathered. For this purpose, a central research question has been formulated which reads as follows: *"What is the effect of including demographics and design standards in the 15-minute city to allocating amenities in Woensel West?"* To answer the central research question, sub-questions have been drawn up:

1. What is the history of Woensel West, the current situation, concerning its liveability, and demographic composition?
2. To what extent does Woensel West meet the 15-minute concept concerning amenities?
3. What are the demographic amenity needs of Woensel West according to the 15-minute city, concerning design standards now and in 2040?
4. To what extent are the amenity needs of Woensel West met relating to the 15-minute city, according to the inhabitants?

As a result, the research question will be answered to contribute to the literature, by giving new insights, and strategies on whether the 15-minute concept can be improved using demography and thereby the sustainable development of cities. This will be substantiated by a chart of amenities present within 15 minutes of walking and cycling of the centrum of Woensel West, an inclusivity chart of social services relative to demographics, coded interviews with experts, a survey amongst inhabitants, and a data analysis conducted through SPSS. The method and operationalisation are further explained in Chapter Three.

1.6. Demarcation

To carry out this research, theoretical research will be done on the 15-minute city, creating criteria that, according to the literature, serve to improve liveability in Woensel West by allocating amenities. Under these criteria emerge the types of amenities that are meant and will be operationalised. The same will be done with demographics and amenities. Afterwards, it will be examined whether the neighbourhood meets the 15-minute city according to the criteria using a diagram in Excel, a map of which amenities are present and lacking, and how many there are present, concerning national averages. Next, demographic data will be examined, the importance of allocating amenities and design standards as a method. To test the outcomes of these steps, a survey among inhabitants and interviews will be carried out to investigate social needs, and confirm, or sharpen the outcomes. Moreover, statistical tests will be done to verify the survey results and draw conclusions. The conclusions of the results emerge on the inclusion of demographic data versus without the use of demographic data in the 15-minute city and what is the correlation of the survey and experts relating to the main research question.

1.7. Structure

Chapter two describes the theoretical framework of this study, reviewing the relevant literature regarding the 15-minute city, demographics, and the research theory in which the variables of this research are described and denoted by the conceptual model. Chapter three focuses on discussing the methodology and accounting for the design and conduct of the study. Chapter four presents the results of the research done. In Chapter Five, the conclusion answers the main question and presents the results for discussion and recommendations.

2. Theory

This chapter elaborates on the theory as the basis of this research. This is done by explaining the 15-minute concept and its characteristics and the allocation of amenities to achieve its goals by literature. Subsequently, demographics and design standards are explained as the importance of city planning, and the interrelation among them within this research, followed by the conceptual framework. At the end of this chapter, the sustainable contributions, and critics according to the concept are explained.

2.1 The 15-Minute City, and its Relationalities to Demographics and Amenities

2.1.1. The 15-Minute City

Currently, the world is experiencing the fourth industrial revolution, marked by the widespread use of Information Communication Technology (ICT). This revolution offers numerous solutions to urban challenges, particularly through the Smart City concept and the 15-minute city. Cities can enhance service delivery and promote sustainable practices. According to Moreno (2021), prompt service delivery is central to the 15-minute city concept, aiming to maximize the time urban dwellers have to access basic amenities and improve urban liveability.

Moreover, liveability refers to the environment from an individual's perspective and includes a subjective evaluation of the quality of the place. It is also defined as a key aspect contributing to a high quality of living (Medayese et al., 2021; Opdam, 2009). This high quality of living impacts inhabitants' lifestyles and health conditions within the built environment (Medayese et al., 2021). The liveability and vibrancy of the built environment are increasingly discussed globally, assessed through the needs and wants of urban residents (Medayese et al., 2021). Key components contributing to urban liveability include a healthy environment, decent housing, safe public spaces, congestion-free roads, parks, recreational opportunities, vibrancy, and amenities (Medayese et al., 2021). Liveability also ensures the right to the city for various groups, including the homeless, working-, middle- and affluent classes, migrants, and other vulnerable populations (Medayese et al., 2021). Despite its subjectivity, liveability involves addressing and balancing the economic, environmental, and social dimensions for urban residents to foster sustainable development and create liveable cities (Moreno et al., 2021; Medayese et al., 2021; Gupta & Vegelin, 2016). This approach is sustainable because it incorporates community input, making it a bottom-up process (Enqvist et al., 2019).

Therefore, the 15-minute city concept came into the picture as a theory and method to achieve sustainable and liveable cities addressing these dimensions. The concept aims to do this by weaving the six essential amenities into neighbourhoods, within 15 minutes of walking or cycling from their home. As a result, residents will interact more with each other and participate in activities that ultimately strengthen their social bonds, creating resilient communities and building character and trust, leading to healthier urban landscapes (Moreno et al., 2021). Moreover, Moreno's vision of a "living city" emphasises the need to repair urban and social fragments influenced by modernist approaches (Moreno et al., 2021; Casarin et al., 2023). Therefore, several municipalities and cities worldwide have incorporated the 15-minute city as a concept to their policy since Moreno presented it to enhance cities on these three aspects, of which social interaction is part of the social dimension.

Likewise, examples of cities that incorporated the 15-minute city are Paris, Milan, Barcelona, Gemeente Eindhoven and Gemeente Utrecht, which even wants a 10-minute city (Gemeente Utrecht, 2021b; Moreno et al., 2021; Casarin et al., 2023; Gemeente Eindhoven et al., 2024). By implementing the 15-minute concept, Moreno argues that residents can have a higher quality of life by performing due to the six essential urban amenities: living, working, commerce, healthcare, education, and entertainment. Therefore, the urban landscape must be restructured to ensure the dimensions of proximity, diversity, density, and ordinariness, in which people can live, work, and stay in

these neighbourhoods without having to constantly commute elsewhere, as visualised by Image 1 (Moreno et al., 2021).

Moreover, the concept of density in urban planning has evolved to focus on the density of people rather than just building density. The 15-minute city emphasises the proximity of amenities within urban spaces, while also allowing for flexible use of space to maximise options. Diversity is a key aspect of this concept, with mixed-use neighbourhoods and a focus on cultural diversity for vitality and attractiveness. The application of digital technologies, or digitalisation, is also seen as integral to creating a smart and vibrant city, with the active use of data. Examples of these technologies include inhabitants' participation and reporting through digital platforms. Overall, the 15-minute city concept promotes a sustainable, healthy, and convenient urban lifestyle by emphasising accessibility and a well-designed urban environment concerning the social-, economic, and environmental dimensions of sustainability now, and in the long term (Moreno et al., 2021; De Maat, 2021). Some sustainability contributions are further described in Appendix 1. Besides, the aspects which Moreno emphasises are also found important by Jane Jacobs (1992). Moreno believes that incorporating urban amenities according to these components is crucial in creating cities that offer valuable urban life experiences (Moreno et al., 2021; Casarin et al., 2023). However, to offer these life experiences, the literature finds that it may be neccessary to include demographics to allocate amenities.

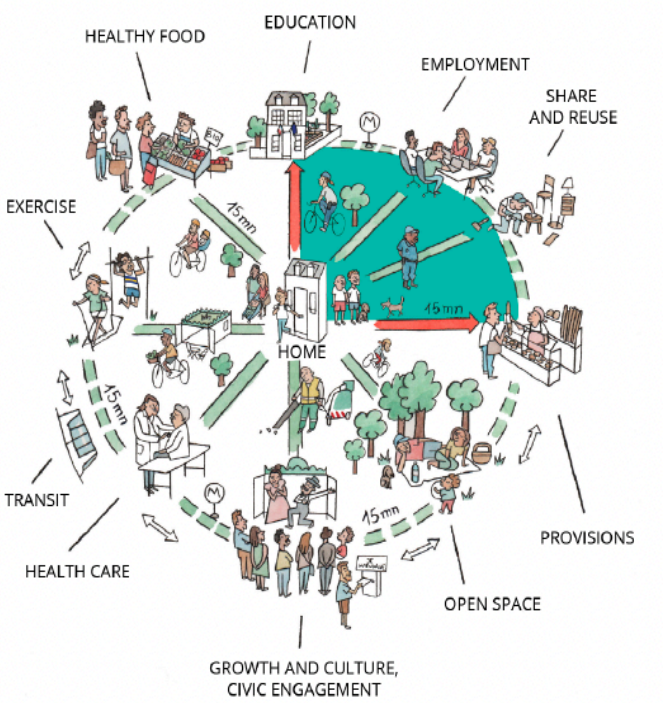


Image 1 The 15-minute city diagram (Nelson, 2021; Moreno et al.,2021)

2.1.2. Demographics and Design Standards

Urban economists and scientists highlight the role of amenities in driving urbanization and suburbanization (Carlino & Sáiz, 2008). City consumers prefer a wide variety of goods and services, benefiting from substantial economies of scale, as economic welfare depends on the size of the local market. A greater variety of consumption amenities becomes particularly attractive to households as their wealth increases. This desire for urban amenities and variety significantly contributes to population concentration in cities (Carlino & Sáiz, 2008). Therefore, researchers argue that amenity levels should be associated with demographics (Carlino & Sáiz, 2008; Reza Khavarian-Garmsir et al., 2023).

In addition, demographics encompass the demographic trends and phenomena associated with urban lifestyles (De Mello & Di Cesare Giannella, 2019). It is defined by Cambridge Dictionary (2024) as: "the number of people who live in a particular area or form a particular group, especially concerning their age, how much money they have and what they spend it on" (Cambridge Dictionary, 2024). Demography as a scientific field studies population characteristics, composition, and development, making use of statistics in quantitative studies as well as its interfaces with other science fields like sociology, economics, public health studies and environmental studies among a large series of others to develop more qualitative analysis. Therefore, understanding contemporary social dynamics through demography is essential for analysing issues related to social and economic development (De Mello & Di Cesare Giannella, 2019). For example, population ageing is currently a significant challenge faced by many EU countries, leading to increased demand for healthcare, social security, and elderly care (Burian et al.,

2019). The sociodemographic analysis aids decision-making processes for geographers, city planners, economists, and policymakers by providing evaluations and estimates (De Mello & Di Cesare Giannella, 2019; Schmitt, 1952).

In addition, in urban planning, it is very important to use design standards, as these are usually expressed in terms of population (Schmitt, 1952; Addas, 2023; Jha, 2020). A larger population will need more businesses, more housing, more offices, more schools, more health centres, more open spaces, and other physical, social, and recreational infrastructure. These projections are based on standards for various amenities that have been worked out and are accepted by city plans (Schmitt, 1952; Jha, 2020). Therefore, these standards vary from country to country, city to city and are necessary (Schmitt, 1952; Jha, 2020). The Hague, Utrecht, and Amsterdam City Councils, for instance, have Design Standards that are self-composed on their method based on population or household count and sometimes vary per urban landscape (Gemeente Den Haag, 2021; Gemeente Utrecht, 2021b; Gemeente Amsterdam, 2018).

Moreover, without estimates based on design standards according to population, planners cannot effectively set the scale for long-range plans. Although planning standards may vary between texts or reports, they are generally expressed as ratios, making demographic data essential for city planners (Schmitt, 1952; Jha, 2020). City planners require a different type of population analysis than traditional demography provides (Schmitt, 1952). Urban problems are rarely addressed in national-level research, necessitating specialised studies, such as "micro-demography," which focus on the restricted service areas relevant to urban planning (Schmitt, 1952).

Urban planning standards should ensure access to public service infrastructure by specifying program indicators based on population size and distribution rules for service amenities (Addas, 2023). The importance of this relationship will be tested within the context of the 15-minute city.

2.1.3. Conceptual Framework

Tobler's law suggests that the interaction between two places decreases as their distance increases (Wu & Divigalpitiya, 2023). Moreover, the 15-minute city concept is described as a one-size-fits-all approach and argued by literature that the concept does not always fit within a specific area, as it does not address demographic information and social needs. Therefore, to successfully incorporate the 15-minute city to weave the right amenities in the right place, research needs to be done into what the contribution of demographics means, addressing certain needs, allocate the right amenities to be more efficient in achieving their goal. As a result, the conceptual framework of this research is displayed, in which the 15-minute city is the independent variable (cause), 'demographics and design standards' is the moderating variable, and 'allocation of amenities' is the dependent variable (outcome) (Scribbr, 2021).

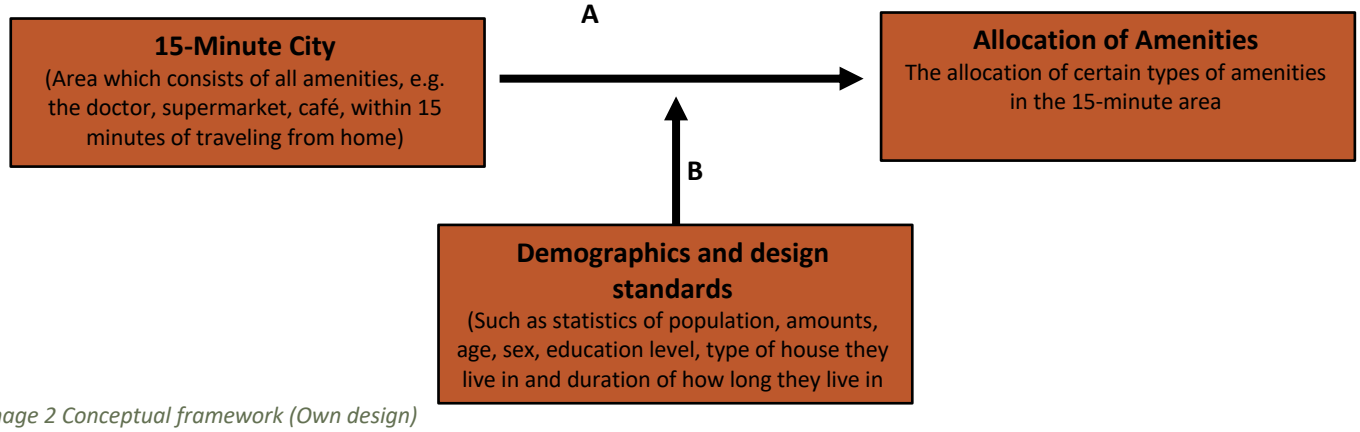
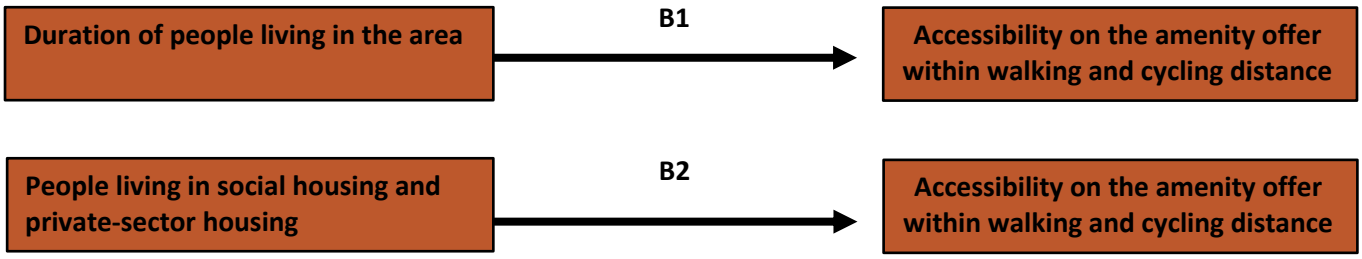


Image 2 Conceptual framework (Own design)

To measure the 15-minute city, Woensel West will be assessed whether it complies with the criteria of the 15-minute city. Demography and social needs will be measured by design standards, addressed by population growth, and characterised by age, sex, household, population, and other characteristics to see if there are differences when incorporated in the comparative research of A and B as shown in the conceptual framework. The method and operationalisation will be addressed in the next chapter, which will elaborate more. According to the main research *"What is the effect of including demographics and design standards in the 15-minute city to allocating amenities in Woensel West?"* The expected outcome is that including demographic data has an influence on the amenity offer and gives a more detailed insight into local social needs when the 15-minute city is implemented, as opposed to not including demographic data. In addition, the inclusion of demographic data can provide more insight into the local context for matching amenities, for example, as we look at the satisfaction of the amenities present, their accessibility, their applicability to target groups and any social needs (in the specific area). This would be a qualitative addition to the 15-minute concept, as opposed to not including demographic data and allocating amenities.

To delve deeper into the variable 'demographics and design standards' and the relationship of B on A, two additional conceptual models were created. Here, two things are stated: first, the duration of how long population groups live in the neighbourhood has an effect on the perceived accessibility of the amenities within 15 minutes of walking and cycling from the study area. Second, it examines whether there is a difference between those living in social rented housing and experience more accessibility to amenities within 15 minutes of walking and cycling as opposed to those living in private sector housing.



Hypothesis

Using the above conceptual models to answer the main question, the following hypotheses were made:

- H0: The length of time someone lives in Woensel West does not affect the accessibility of the amenities within 15 minutes of walking and cycling in Woensel West
- H1: The length of time someone lives in Woensel West affects the accessibility of the amenities within 15-minute walking and cycling distance
- H0a: There is no difference in amenity accessibility between residents of social rented housing, compared to residents of private sector housing
- H1a: there is a difference in the amenity accessibility between residents of social rented housing, compared to residents of private sector housing

If the hypothesis for this is rejected or retained, it will complement the answer to the main question at the target group level within demographics.

2.2. Amenities within the 15-Minute City

Amenities are a broad concept. According to proximity statistics by CBS (2017), an amenity is defined as: "A location (building, space, site or place) that can be visited by persons." This broad definition makes it clear that there are many types of amenities in the literature (De Maat, 2021). The literature on the 15-minute city therefore presents various terms and definitions related to the concept. To indicate the difference by literature, Elizabeth Knap (2022), did research to define the 15-minute city, she states that the amenities according to Moreno (2021) (living, working, commerce, healthcare, education, and entertainment), are not clearly defined, and differ per research in its operationalisation (Knap, 2022). The differences from Knap's (2022) literature review are shown in Table 1.

Table 1: Services in the academic literature on 15-minute cities (Knap, 2022)

Source	Services	Use
Moreno et al. (2021)	Categories: Living, Working, Commerce, Healthcare, Education, Entertainment	Definition
Weng et al. (2019)	Services: education (school or training institution), municipal administration (public transport; park and square; sports venue; cultural venue), Finance and telecommunication (finance and post office) Commercial service (restaurant, shopping, entertainment venue) elderly care (nursing home or elderly education)	Measuring walkable neighbourhoods
Pozoukidou & Chatziyiannaki (2021)	Categories: Work, Basic healthcare, Cultural and recreational opportunities, “key recourses”.	Assessing/ evaluating transportation plans
Carpio-Pinedo et al. (2021)	Land-use types: Industrial, Offices, commercial, sports, showbusiness, leisure and hospitality, health, cultural, religious	Measuring walkability
Gaxiola-Beltrán et al. (2021)	Services: schools (preschool, primary school, secondary school, technical secondary school, high school), Hospitals (general hospital, addiction and psychiatric hospitals, other hospitals) Other (supermarkets and employment centres)	Assessing urban accessibility (walking and cycling)
Graells-Garrido et al. (2021)	Categories Education, Entertainment, Finance, Food, Government, Health, Professional, Recreation, Religion, retail, public transport	Measuring 15-minute accessibility (walking)

In addition, Marchovska (2020) made a possible distinction into five types of amenities which are often apparent in the Netherlands, which are shown schematically in Table 2.

Table 2 Amenities according to Machovska (2020) in X-minute cities in the Netherlands

Amenity Category	Amenities	Amenity category	Amenities
Commercial services	Supermarket	**Food services**	Café
			Restaurant
Medical services	Hospital	Green spaces	Allotment
	Pharmacy		Park
Transport services	Light rail		Orchard
	Bus stop		Recreation
	Train station		

2.3. Critics of the 15-minute City Concept

According to the research of Knap (2022), the working category within literature is not clearly defined, as the concept suggests that everyone should be able to work within 15 minutes of distance. Knap (2022) found that there is no distinction made between different types of jobs or workers in her literature research according to the literature of Moreno et al., (2021), Carpopinedo et al (2021) and Pozoukidou & Chatziyiannaki (2021). No distinction between job types and education levels can greatly influence results, especially now people work an increasing distance from home (Boussauw & Witlox, 2013).

Likewise, the influence of spatial proximity is strongly related to the type of destination of the relocation in question (Boussauw & Witlox, 2013). The more specialised the destination, the greater the distance people are willing to travel and the Smaller the likelihood that they will want to exchange this destination for an equivalent destination close to home. In the terminology of Christaller's (1966) theory, this refers to the upper limit of central amenities (Boussauw & Witlox, 2013). Segmentation in the labour market has meant that workers in specialised sectors are willing to commute over several tens of kilometres each day ebbing that the average distance between home and workplace has grown steadily (Boussauw & Witlox, 2013). For example, high-educated men travel on average over 35 kilometres on weekdays in commuting, while low-educated men travel an average of 26 kilometres (CBS, 2016). The average commuting distance of all jobs and persons, including in one's home municipality, is 22 kilometres (CBS, 2022). Here, commuting distance is defined as the distance by road between the centre of the neighbourhood where one lives and the centre of the neighbourhood where one works (CBS, 2022).

We can therefore say that many people have to travel further than what is considered a bikeable distance to work (knap, 2022). Hence, a fair question could be: "How realistic is working within the 15-minute city?" However, less specialised amenities, for example, primary-, secondary-, and higher education are considered substitutable, where the average distance is less (Boussauw & Witlox, 2013). Moreover, also Guzman et al (2024), suggest that despite its aspirations, the 15-minute city may promote inequality. Here, in addition to (Carlino & Sáiz, 2008; Reza Khavarian-Garmsir et al. 2023), Guzman also emphasises the importance of demographics and one-sidedness in distances for amenity presence. In addition, there is a distinction in the type of amenities and their accessibility for demographic segments. Especially the amenities that are accessible to every demographic segment, for example healthcare amenities as opposed to those that are often only accessible to the affluent segments. This is about the allocation of commercial amenities. Therefore, Guzman et al. (2024) argue for a unified measurement tool for the 15-minute concept, which ensures that urban landscapes are more fairly tailored to local populations and their capabilities. In doing so, this measurement tool should also clarify what kind of amenities belong to the 15-minute

concept, as this is not concretised. This makes it easier to know which amenities should be facilitated (Guzman et al., 2024).

From a conceptual perspective, Lu and Diab (2023b) find that although accessibility is central to the 15-minute city concept, it is poorly defined, measured inconsistently and in some instances, misunderstood in their study of existing planning documents in North American and Australian cities. Besides, according to Geurs and Van Wee (2004), X-minute cities' implementation in policy documents is often used as a place branding method instead of addressing the inequalities within a city itself (Guzman et al., 2024). To address the above limitations, Birkenfeld et al. (2023) stress that planners and policymakers must accommodate for variability in actual travel behaviour, which is influenced by age, gender, physical ability, class, and built environment. Moreover, Knap (2023) finds that there is scarce research on measuring the concept using accessibility metrics, and how it varies across sociodemographic groups at the neighbourhood level within the city (Guzman et al., 2024).

Finally, Guzman et al. (2024) note that it is important to know that it is imperative to acknowledge that individuals do not share uniform desires, nor do they perceive the built environment identically. Our framing acknowledges that certain demographic groups may prioritise the proximity of hospitals or educational institutions, while others may prioritise the proximity to their workplaces, while others may emphasise the accessibility of cultural and recreational amenities close to their residences. The role of these preferences in the context of the 15-minute city concept has yet to be disentangled (Guzman et al., 2024).

3. Methodology and Operationalisation

As the theory of this research is formulated, this chapter will justify and elaborate on the research strategy, the method for data collection and the analysis to answer the research question based on the theory. First, the positionality and the operationalisation of this research will also be elaborated.

3.1. Research Strategy and Method

This research aims to provide a descriptive analysis with elements of exploration and definition. To determine the research strategy, the Research Union of Sounders et al. (2015) framework is employed to address both the main and sub-questions of the study. I have chosen interpretivism as a philosophical stance, emphasising the significance of comprehending the differences among individuals as social actors. This perspective distinguishes between objects and people, considering individuals as social actors who interpret their surroundings. Through these interpretations, individuals construct meanings about the world and their actions. Thus, adopting an empathetic approach is pivotal in grasping the meanings created by social actors.

Within the scope of this research, the induction approach is selected. According to Streefkerk (2023), and Collaborators, (2023), the inductive research approach is a method one must collect and analyse data to develop theories, concepts or hypotheses based on patterns and observations in the data. It uses a "bottom-up" method in which one starts with specific observations and then move on to more general theories or ideas. This approach is often used in exploratory studies or when not much research has been done on a topic before. It is flexible and adaptable to new findings and relies more on qualitative analysis (Streefkerk, 2023; Collaborators, 2023).

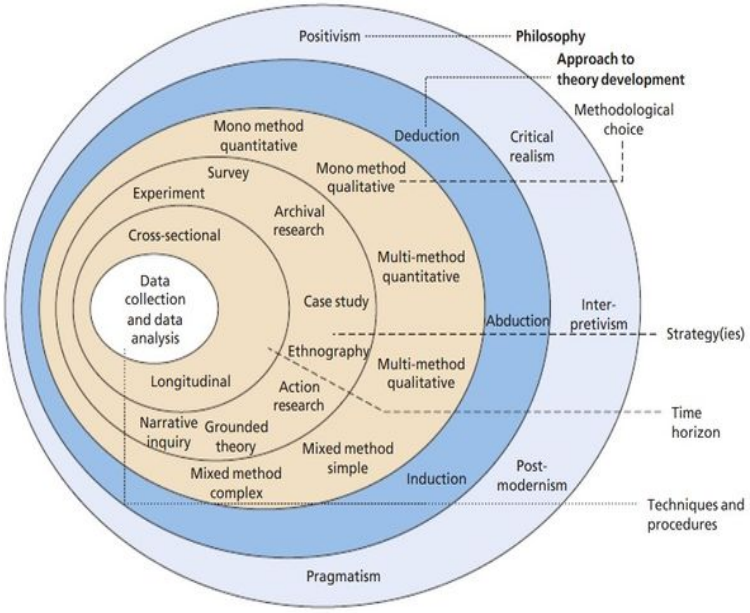


Image 3 Research Union (Sounders et al., 2015)

This aligns with the nature of the research, which possesses a mixed methods character, primarily quantitative with qualitative components. The quantitative aspect is motivated by the need to explore demographic data quantitatively, which will bolster the argumentation and offer a deeper analysis of the topic. However, these findings will be backed up, or tested with a survey amongst the inhabitants, which is a bottom-up approach. Besides, the qualitative part consists of expert interviews in which the interview questions will be developed based on new findings of the interviews. In addition, the theory of the 15-minute city is rather new, and this research aims to develop the theory further. Therefore, based on the frameworks provided by Sounders et al. (2015), Benders (2021), and Van Thiel (2015), a case study strategy is deemed appropriate, as it allows for concrete, contextual, and in-depth understanding of a specific topic. Moreover, as the data is collected from a population of a specific time, the time horizon is longitudinal according to (Scribbr, 2021a).

Altogether, this research focuses on the neighbourhood of Woensel West in Eindhoven, characterised by specific spatial features and context that render it a unique research area. Opting for a case study design ensures the reliability and trustworthiness of the combined methods in such circumstances, which is commonly observed in geographical and sociological research. However, it is acknowledged that case studies have limitations regarding the trustworthiness of findings, a concern that will be addressed later in the discussion. This applies similarly to the

interviews planned for this research. Moreover, the used methods and operationalisation will be described in the following paragraphs.

3.2. Operationalisation

Van Thiel (2015) describes that when operationalising, terms should be made 'measurable'. Operationalisation centres on me as a researcher describing what will be measured. For this, three steps must followed. First, a definition should be given of the terms to be studied. This way, it can be defined what will be investigated. The reason for this is that theoretical concepts are often complex and therefore not always easy to explain. Next, we look at what way the theoretical concept looks like in practice and which way of this is chosen to 'measure' in the research. Then, it can be determined what scores or values these theoretical concepts can take on and in what way they relate to each other. Therefore, in the next paragraphs within this chapter, the above information is presented for each variable what serves as the measurement instruments of this research.

By way of illustration for assigning a definition to the 15-minute city, the literature on the subject in the theoretical framework was considered. Moreover, the 15-minute city is a difficult phenomenon to measure because of its diverse meanings, and measurements. All associated amenities relevant to this study are subdivided within the categories of the literature: living, working, commerce, healthcare, education, and entertainment. The subdivided amenities, for example a doctor, supermarket and so on, serve as indicators. As a measurement tool, the choice was made to use the distances from the comparative literature review of Knap (2022). These distances came from The Congress for New Urbanism and examined what distance can be covered within 15 minutes and therefore serve as a measurement tool. Further justification, and explanation of the 15-minute city, and other variables are described in the next sections, starting with the 15-minute city.

3.2.1. Variable: The 15-minute City

Definition of the 15-Minute City

The concept of the 15-minute city refers to an urban planning approach where residents can access all essential services, amenities, and resources within a 15-minute walk or bike ride from their homes. However, measurement is needed, as it is a broad concept and not further conceptualised and operationalised.

Indicator of the 15-Minute City

This section discusses the types of amenities in the 15-minute city concept and which ones are guiding this study. As indicated earlier, amenities are a broad concept. For this study, I made a combination of Machovska's operationalisation (2020) which was described in the theoretical section, the vision of the municipality of Eindhoven according to their view of the 15-minute city including their critics, and my adjustments, and subdivided into the categories: commerce, healthcare, education, public transport, green spaces, and entertainment was chosen. These categories contain amenities that fall under the specific category and form the indicators for this variable. These indicators/amenities are visualised in Table 3. Each category of the 15-minute city concept represents certain general amenities that should be present in cities. These provide the basic needs of residents and visitors. If certain amenities are not present within the 15-minute walking- and cycling distance, the concept indicates a certain need for it, and the 15-minute concept is not met.

Concerning this research, every category is represented except 'living' and 'working'. This is because of the critics of the literature and from the municipality from several experts. Living is defined by Moreno et al. (2021) as "anything to do with leading a comfortable life". For this study, this is considered too abstract and large a concept to include within the time frame and scope of this research. Therefore, I chose to focus on the other categories below for this study.

Moreover, working is incorporated into the amenities where people can work. This leaves out jobs, but as described earlier under 'critiques for this concept', jobs are difficult to measure the more specified the work is. Therefore, this category has been partially incorporated with the specified amenities that are shown in the categories.

Table 3 Available amenities in the Netherlands according to literature, the municipality of Eindhoven, Amsterdam, STIPO (STIPO, 2012; Gemeente Amsterdam, 2018; Machovska, 2020; Gemeente Eindhoven, 2024c)

Amenity category	Amenities	Amenity category	Amenities
Commerce	Supermarkets	Entertainment	Hospitality: restaurant, cafeteria, café, lunchroom, delivery service)
	Drugstores		Museum
	Other daily retail		Exhibition space
Healthcare	Doctor		Gym
	Pharmacy		Sports field
	Physiotherapist		Playground
	Dentist		Gymnasium
	Childcare	Green spaces	Local Park
	Community Centre	Education	Primary education
	Consultation office		
	Mental healthcare (GGZ in Dutch)		Secondary education
	Youth centres		
	Obestric		
Public transport	Bus stop		
	Trainstation		

Measurement of the 15-Minute City

This study constantly talks about the 15-minute city and takes a closer look at the distance people travel on average in this time frame and serves as a measurement tool. As the 15-minute city is defined by the distance that can be covered by walking and cycling, distances are not the same, and therefore not rigid, and can be adjusted in different cases or contexts. Therefore, a distinction will be made in this study as proximity indicators might be defined differently for cyclists than for pedestrians (Moreno, 2021).

Hence, the defined measurements for this research are from The Congress for New Urbanism (CNU) and are taken as the basis, in which a distinction has been made within the 15-minute city for 15-minute walks and 15-minute bike rides. Therefore, a radius of 1.2 km is defined as an appropriate distance within 15 minutes by walking (Knap, 2022). This average is determined as younger people walk faster than older people in addition men walk faster than women and in the summer season, both sexes walk faster (Montufar et al., 2007; De Maat, 2021). As for cycling, men between 25 and 55 of age cycle an average of 14 kilometres per hour and women between the same age cycle 12 kilometres per hour, according to research by CBS (CBS, 2002).

For this study, the female distance is used, as women's distance is the lowest. Per 15 minutes, the average speed comes to 3 kilometres. Within this research, all amenities within 1.2- and 3-kilometres longitude are considered. For this study, every amenity within the categories and the 15-minute walking and cycling distance from the central point of Woensel West is part of the 15-minute city and considered. Everything that is outside the 15-minute boundary is not considered as it is not part of the 15-minute city. Hence, when a specific amenity is not present within the 15-minute city within the cycling range, the area does not meet the concept and indicates that the is a certain need for it, by literature and by this operationalisation in this research. The amenities within the area will be searched by the external research report that marked amenities, but also by the search engine of My Google

Maps, by searching “restaurant”, “sportsfield” and synonyms to be more accurate in finding the amenities. Then, these will be marked with My Google Maps to make a visualisation of the 15-minute city from Woensel West. My Google Maps is a tool which makes it possible to make your map, based on the map of Google Maps. As there might be a difference between the report and Google Maps. If there may be a difference between My Google Maps and the advisory report in showing an amenity, the choice of marking an amenity will depend on the amenity, by taking a closer look at the website that Google Maps provides, or whether the amenity exists or not. After this process, when these amenities are found these marked amenities will be counted and scheduled in Excel to make a clear overview and the quantity of each amenity within the 15-minute walking and cycling distance.

Moreover, the municipality of Eindhoven’s interpretation of the distance and basic amenities of the 15-minute city is like the literature, with the municipality committing to all basic amenities within 15-minute cycling and walking distance according to the mentioned distance. Preferably, these amenities are concentrated near high-quality public transport lines and in the city centres. In addition, while answering sub-questions three and four, design standards based on demographic information are combined with these amenities and form an additional measurement to allocate amenities according to the following amenity scheme.

Relation A: The influence of variable “the 15-minute city” on the variable “the allocation of amenities.”

Amenities are part of the 15-minute city, based on the categories and the operationalised amenities. In other words: A place satisfies the 15-minute city if the relevant amenities are present within a 15-minute walk or cycle from a given starting point. In this sense, you could say that the variable unilaterally influences the allocation of amenities. This is measured by counting the amenities present within 15 minutes of walking and cycling. By keeping track of this schematically, it is possible to know which amenities are present, which are absent and whether the area thus satisfies the 15-minute city.

3.2.2. Variable: Demographics and Design Standards

Definition

This variable is defined as the number of people who live in a particular area or form a particular group, especially concerning their age, how much money they have and what they spend it on (Cambridge Dictionary, 2024). Demography as a scientific field studies population characteristics, composition, and development, making use of statistics in quantitative studies as well as its interfaces with other science fields like sociology, economics, public health studies and environmental studies among a large series of others to develop more qualitative analysis (Cambridge Dictionary, 2024).

Furthermore, as mentioned before, in urban planning it is very important to use design standards as these are usually expressed in terms of population (Schmitt, 1952; Addas, 2023; Jha, 2020). Design standards are a tool to represent needs. A larger population will need more businesses, more housing, more offices, more schools, more health centres, more open spaces, and other physical, social, and recreational infrastructure. These projections are based on standards for various amenities that have been worked out and are accepted by city plans (Schmitt, 1952; Jha, 2020). These standards vary from country to country, city to city and are necessary (Schmitt, 1952; Jha, 2020). Without the estimates called for by design standards, the planner would be unable to set the scale for the long-range plan. While the exact nature of planning standards varies from text to text, or between given planning reports, their general expression as ratios is almost a uniform practice, it is for this reason that city planners must look to demographics for a necessary part of their background information (Schmitt, 1952; Jha, 2020). Design standards, as urban and municipal devices, have become one of the most powerful place-making forces currently operating in U.S. suburbs (Rotenberg, 2015).

Indicator

The indicators for demographics and design standards are as follows. The people living in Woensel West can be distributed by different statistics: in absolute numbers (by population), age, sex, income, type of house they live in if they have children living in the same house, education, or a combination of these factors, or other factors. Within this research, these are the indicators that are used. Design standards are standards, related to amenities and demographics to form a certain standard, which makes it possible to make a 'needs' estimation based on the national average within this research. The outcome of this calculation represents a certain number of amenities needed or a factor of presence concerning the national average. Besides, design standards make it also possible to assess the presence of the amenities within the research area, wether the presence is less well represented in the area concerning to the standard, or more. The measurement is described in the next section.

Measurement

Within this research, this variable uses demographics and design standards to represent the needs of inhabitants and to give an additional scale to what amenity is needed within the 15-minute walking and cycling distance, based on the presence of a certain amenity (sub-question 2 and 3), and accessibility sub-question 4). Additional tools are the survey and expert interviews to represent local needs based on demographics.

Demographics and design standards

In this research, demographics are measured and categorised by amount of people, age, and households in the current time, and 2040. The forecast for 2040 however, will be based on population amounts, as the research area is too small to make a reliable forecast based on more characteristics, and data is not available due to this reason (Policymaker 2). By answering sub-question 3, the design standards of the municipality of Eindhoven are used to assess the presense of amenities, in the designstandards comes from a consultancy bureau they had a partnership with. The design standards which are used are shown in Table 4.

Table 4 Design Standards based on an external dataset from a collaboration between a research bureau and the municipality of Eindhoven (2024)

Amenities daily needs	Per 1.000 inhabitants (National average 2024)
Doctor	0.48
Physiotherapist	0.95
Dentist	0.52
Childcare	No data
Pharmacy	0.13
Community centre	0.12
Consultation office	1.30
Psychologist	0.18
Obstetric	0.06
Shelter location	No data
Primary school	4.43 per 1.000 4 - 11-year-olds
Secondary education	0.47 per 1.000 12 - 18-year-olds
Supermarkets	0.43
Other daily retail	1.2
Drugstore (Personal care stores)	0.43
Hospitality (restaurant, café, cafeteria, lunchroom, coffeeshop delivery services)	3.5
Museum	0.06
Exhibition space	0.04

Local parks	No data
Gym	0.33
sports field	0.95
playgrounds	No data
Gymnasiums	0.33

It is important to note that while some amenities are indicated, no statement can be made of some amenities because there are no guidelines for them, no data on them, or they have an urban, regional, national, or international appeal and are therefore infrequent. This applies to those amenities marked "no data", or amenities that are not written down. These include a train station, bus stops, a university, and an airport. However, bus stops are included in the survey as there might be a need for a bus stop nearby, despite there being no data to make a statement. Concerning education, special education and international schools are also included but generalised with regular education. The demographics that are measured are age, education level, the number of people living in the neighbourhood, it is found out whether people live in social rented housing and free sector housing, and the length of time someone lives in the neighbourhood in the following categories:

- 1 - 2 years
- 3 - 5 years
- 6 - 15 years
- 15 years or longer
- People living in private-sector housing
- People living in social housing

This is done through databases, for example allecijfers.nl and eindhoven.incijfers.nl. Moreover, demographic information and their needs will also be measured by a survey of residents on the presence of amenities and their accessibility. This information is important to investigate and understand the relationship to the accessibility of the amenities, but also their satisfaction to answer the main question.

To find out needs in addition to the survey, interviews are conducted with local experts who are in frequent contact with the local population to find out their needs, should there not be enough participation from residents in the survey. Experts for Woensel West are an area coordinator of Woensel West from the municipality of Eindhoven and a programme manager from the local housing corporation who together run a neighbourhood organisation to improve liveability. As they are experts and have a lot of contact with residents, they are trustworthy to interview them about the needs of the local community.

Survey and statistical analysis by the Chi-Squared test

To collect data on the population of Woensel West, the survey will consist of a random sample. This means that statements are made about the entire population. This will be done over satisfaction with the available supply, accessibility, and desired amenities within walking and cycling distance. In addition, a stratified sample is used to gain insight into whether the length of time people live in Woensel West affects the accessibility of the amenities within walking and cycling distance. Next, it is also examined whether there is an accessibility difference per facility between people living in social rented and private-sector housing. While analysing the survey results, a statistical Chi-square test is performed to see if the categorical outcomes of the independent variables are statistically significant. This is explained in more detail under the reliability and validity section.

According to the creation survey, the survey must be accessible to as many respondents as possible, therefore attention must be paid to the language and thus its wording should be relatively easy to understand. Especially in Woensel West, as there are 115+ nationalities and low literacy in the neighbourhood, it is necessary to use easy language to increase participation. Because of this, the choice was made to use Dutch as a language at the B1 level, on the advice of experts (Policymaker 1; Policymaker 2). Should this not be accessible to respondents, it is possible to use the 'translate page' function within the browser, should this be necessary. It is worth noting here that not everyone knows about this translation option.

To obtain specific and desired answers, it is important to carefully word the questions and ensure they are specific. However, some topics, for example income and work situation or housing situation (social, or private housing), may not be suitable for ethical reasons. However, this information can still be important for demographic segmentation purposes and to know what the needs are per demographic segment, to meet them with amenities. Therefore, the questions for this research were developed in consultation with policymakers and an experienced survey researcher, considering the ethical considerations. The survey was designed to increase participation, filter relevant answers, and obtain desired results for each demographic segment. Various types of multiple-choice and open-ended questions were used, tailored to each question and its corresponding answer options. This approach allows for filtering relevant data, understanding the study's scope, and speculating about the demographic segments of respondents and their distribution across different areas.

Moreover, to ensure that as many people as possible respond to the survey, it is important to use as many methods as possible so that many different people can participate. Therefore, creating a flyer with a QR code and hyperlink to the survey is useful to be able to distribute this online, but also "offline", by distributing the flyers throughout the neighbourhood, because not everyone uses certain online platforms, and some people are offline. The methods are described in Section 3.3. Data Collection Methods. Besides, the survey guide, and the survey questions, are shown in Appendix 4 as part of the operationalisation.

Expert Interviews, with the local experts

For this research, local experts will be interviewed about the context and to obtain information about social needs from inhabitants that they acquired by participation methods. The experts are selected based on different aspects. They were selected through research, referrals from municipality employees and introductions with them, and the experts themselves. For this selection, consideration was given to profession, experience, research area, and willingness. These two local experts constantly participate with the local community, the municipality, the local social housing corporation and other experts in the area about a variety of needs and developments in the area and are therefore a reliable source to interview for this research (Interview 3; Interview 4).

Moreover, one of the experts is seconded by the local social housing organisation and is relevant, as that organisation almost own all the social houses in the area and has worked for almost 20 years in the area with a lot of different projects and knows about the local circumstances (Interview 3. The interviews with the two experts provide additional information about the context and local needs of the community in addition to the survey (sub-questions 1 and 4). Even if the survey does not yield the desired number of participants, it is an additional method and resource to find out the needs of the community from a different angle that emerged from their observations and participatory processes. These interviews form the triangulation of my research, as they make the results more reliable, as they confirm the information that is collected by the survey and contextual information from grey literature about the neighbourhood. Besides, it gives insights into the current situation.

Therefore the questions which are these interviews with the local experts are focused on the context of the neighbourhood, to then address the importance of amenities and how they are represented in the neighbourhood,

to link to the presence, and accessibility, of the amenities and the satisfaction of the local population. Therefore, questions were formulated to the experts that, based on the new results, some questions were tightened, and new questions were formulated but also duplicated for confirmation. The interview guide is displayed in Appendix 5 as part of the operationalisation. As a result, the research method for this research will be sharpened or confirmed and triangulation will be added to its confirmation. Interviews therefore aim to substantiate the common answer to the main and sub-questions. The interviewed experts are listed in Table 5.

Table 5 List of interviewed experts. Interview results are shown in Appendix 3 and Appendix 8

Interview	Interviewee	Organisation	Date
1.	Policymaker 1	Municipality Eindhoven	April, 2024
2.	Policymaker 2	Muncipality Eindhoven	April, 2024
3.	Programme Manager	Trudo (social housing corporation)/ Neighbourhood organisation	April, 2024
4.	Area Director	Municipality Eindhoven/ neighbourhood organisation	April, 2024

Relation B: the influence of demographics and design standards on Relation A.

Relationship B: The relationship of what demographics and design standards have on relationship A: the 15-minute city and amenity allocation, is tested by measuring the difference between relationship A and relationship B.

This is done by interviewing experts on what they think about the research method of using design standards, and demographics, as well as measuring needs from the population segmented into demographic groups. In addition, the design standards on multiple methods are used to measure the influence of relationship B on A in this study. Namely, by counting the present supply of each amenity within 15-minute walking and cycling distance and comparing it to the national average to make a statement about the presence of each amenity type and whether it scores above or below the national average.

Since several people from other neighbourhoods use the available amenities, they may not be accessible to everyone. Therefore, interviews, a survey and a statistical analysis will measure the satisfaction and accessibility of the amenities present. This leads to a difference between relation A and B, in that the results may show that: the neighbourhood is provided with all amenities, or not, through quantities and opinions based on local findings. In addition, the results may show that a particular amenity may be common, but there is even more need for it, for this particular amenity, for some reason. In contrast, relation A only provides insight into what is present, but not whether there is more need or less. In addition, relation A is a top-down approach and relation B is a Bottom-up approach which can lead to aligned programming of amenities in the area. Indeed, the results show a difference between the two approaches that answer sub-questions 3 and 4.

3.2.3. Variable: The allocation of amenities

Definition

The last variable is the allocation of amenities, so the type, and quantity of amenities that are to be situated in a specific area, and within this study within a 15-minute distance from a central point. Amenities are there to foresee daily needs and contribute to the liveability of a city. The allocation of the operationalised amenities within a 15-minute radius.

Indicator

The indicator of this variable is the allocation of operationalised amenities according to the 15-minute concept and the process of their allocation within a 15-minute walking and cycling distance radius. The allocation of amenities may differ between relation A and relation A + B. "Allocation" refers to the allocation of the type and location of amenities in the 15-minute city based on concept (relation A), demographics and design standards and demographic needs (A + B).

Measurement

The allocation depends on needs and accessibility within the specific area, according to the literature on the 15-minute city, and according to demographics and design standards. The outcomes from relationships A and B form certain results about which amenities are present (Relation A), available (Relation B), and needed (and which are not) (Relation A + B) and needed in a certain place. These different results are the outcomes that make it possible to answer the main question of why including demographics and design standards is important.

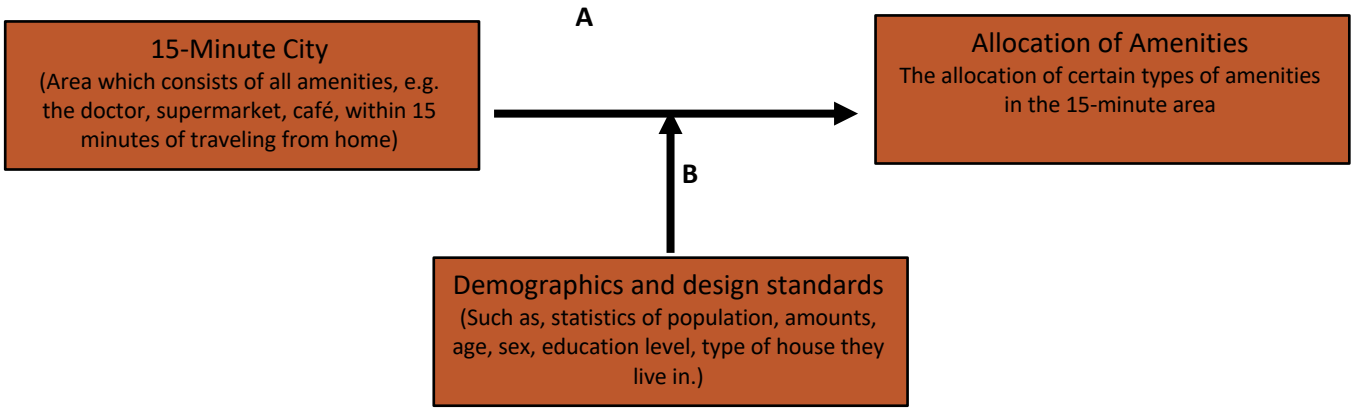


Image 4 Conceptual framework (again)

3.2.4. Selection of two experts for the expert interviews concerning theory and method

To refine and validate the method and theory, experts will be interviewed about the methodology and theory used in this research. The focus will be on the 15-minute city concept for amenity allocation (relationship A), using demographics for this allocation (relationship B), and assessing the needs of the local population (method). These experts were selected based on their profession, experience, research area, and willingness, through organisational research, referrals from municipality employees, and introductions we have made.

The municipality, responsible for sustainable spatial policy formation and implementation, plays a key role. Their policymaking involves placing amenities to meet local community needs, using demography to achieve these goals. Therefore, interviewing municipality officials provides valuable insights and reliable information on involving demographics with the 15-minute city concept in Woensel West.

The selected experts, including policymakers, urban planners, and urbanists from the Eindhoven municipality, possess specific knowledge and experience. They are involved in environmental vision, policy writing for amenity allocation in neighbourhoods, and conduct research using demographic data, making them excellent information sources (Interview 1; Interview 2). These expert interviews will refine the research methodology and add triangulation by confirming the method and theory found in the literature. The interview guide is shown in Appendix 2, and the results are in Appendix 4.

3.3. Data Collection Methods

In the previous sections, I have formulated the operationalisation for this research, making the variables of this study measurable so that results can follow on this basis. This section explains the data collection methodology for each research phase. However, each phase forms the empirical part of this research. The method was developed, confirmed, and refined through expert interviews with two policymakers of the municipality, separately. This involved testing the theory of the research method for allocating amenities, the importance of demographics, design standards, and the methods for investigating needs. This resulted in a study consisting of four phases which are structured as follows:

1. **Expert interviews with policymakers**: The first part involves semi-structured interviews with two experts. These interviews are held by a semi-structured approach, with the two experts mentioned in the operationalisation section with the corresponding criteria.

2. **The 15-Minute City Assessment of Woensel West:** The second part of my research is assessing the neighbourhood of Woensel West to the 15-minute city concept criteria. The aim is to determine which amenities are present and absent in Woensel West and to what extent the area aligns with the principles of the 15-minute city—using a statistical proximity diagram, based on 1.2-, and 3 kilometres of longitude distance for walking and cycling. This is visualised in My Google Maps, counted, and schematised in Excel. In the end, every operationalised amenity is counted and marked within Google Maps. This phase makes it possible to answer sub-question 2.

3. **Needs Assessment Demographic Analysis, Surveys, and expert interviews:**
   Demographics and design standards
   The third part focuses on conducting a deeper investigation into the level of present, and accessibility of the amenities within Woensel West, by analysing demographic information and local amenities present. Databases are utilised to gather data on local characteristics and needs. Various sources for demographics are used, such as municipal records, national statistical agencies, and specialised research agencies provide valuable data. Examples are Allecijfers.nl, Eindhoven.in.cijfers.nl, buurt.eindhoven.nl, CBS, and grey literature concerning this topic from these sources.

   In addition, design standards relating to demographics are from an external data source and are based on research by a research firm that investigated the national averages of amenities, and Eindhoven's amenities on behalf of the municipality of Eindhoven. The demographic information will be calculated with the design standards to give insights into these needs and to give an overview of whether these outcomes align with the amenities present within the neighbourhood. This method is used to see what should be needed according to the design standards, but also to see what the presence is of amenities in and around the neighbourhood within 15 minutes of walking and cycling. Moreover, comparing this result with the results from part one makes it possible to have an idea about the relationship between the 15-minute city and the inclusion of demographics to allocate amenities in a way that adds a certain scale of whether the neighbourhood scores above the national average, or below concerning the inhabitants of Woensel West. The demographics and design standards section I mentioned in the operationalisation section makes it possible to answer sub-question 3. It is important to note that a below-average or above-average supply does not mean whether there is a shortage or a surplus. This is because it depends on accessibility and whether everyone can use the specific amenity.

Survey

Therefore, as the 15-minute city does not have metrics to assess accessibility, surveys are spread throughout Woensel West, among the population. In addition, interviews with the local experts who have a lot of contact with residents did a lot of projects in this neighbourhood and can provide additional insight into whether residents are satisfied with the range of amenities within the neighbourhood and 15-minute cycling distance from their homes, and know if they are available, and which are not and maybe even desired. The survey and expert interviews which are described below are important to answer sub-questions 1 and 4.

Furthermore, the surveys will be spread in multiple ways to increase participation; through multiple Facebook groups from inhabitants of Woensel West, by putting up flyers with a link, and QR-code that leads to the survey in strategic places, a neighbourhood app I have access to, through networking events with experts and neighbourhood volunteers. They have local connections or have access to other digital platforms (WhatsApp groups and Area of People with neighbours to spread the survey even further through these platforms and other methods, for example word by mouth and flyers. In addition, the flyers are placed in strategic places throughout the neighbourhood: where many people come from different demographic segments, examples are at bus stops, Strijp-S train station, supermarkets, hospitality venues, apartment complexes, the care centre, the primary school, and other amenities.

As a result, the outcomes will answer sub-questions 1 and 4, whether the amenities are accessible to residents and the role of design standards in this regard. It could tell whether it is important to take demographics into account when allocating amenities and use metrics to assess the accessibility of the amenities and allocating ones. The result of these methods produces a demographic overview of the community in the neighbourhood, providing a clear picture of the amenities present/absent, but also to which extent the needs are met in the current time, according to data from 2023, and which the municipality could facilitate now to prepare to some extend to the future needs of 2040.

Expert Interviews with local experts

These interviews with local experts are also held by a semi-structured approach with the two local experts which I mentioned in the operationalisation section. In addition, the two experts are familiar with the local needs of the community, as they are the management of the neighbourhood organisation, and are seconded by the municipality, and the local social housing association. These interviews will be transcribed and coded afterwards. This process will be further elaborated in paragraph 3.3.1.

4. **Data Analysis and Conclusion:** The fourth part entails analysing the collected data from expert interviews, analysing the survey results and performing the statistical Chi-squared test to draw the appropriate conclusions and adopt, or reject, the hypothesis. Finally, based on this, the main question can be answered at the conclusion, the discussion can be completed and recommendations and reflections can be written. This phase serves to consolidate the findings and provide actionable insights for urban planning and development in Woensel West.

3.3.1. Interviews

Semi-structured interviews

For this study, a choice was made to interview four experts. The strengths and weaknesses of this flexibility and semi-structured interviews are that it is possible to ask set questions and thus compare the interviews, obtain in-depth information and it is difficult to go off-topic, due to the structure (George, 2023). Simultaneously, the flexibility allows for spontaneous hunches and spontaneous questions, as well as for seeing patterns. Semi-

structured interviews, however, sometimes contain open-endedness, which can make comparison difficult. Other disadvantages are that validity may be questioned due to flexibility and a higher likelihood of research bias because certain questions may give a desired answer (George, 2023). Semi-structured interviews are conducted physically to catch the right interpretation and expressions from the interviewees. Then, transcripts are made of these semi-structured interviews and further coded using ATLAS.ti by the following methods:

1. **Inductive coding/ open coding:** This is a ground-up approach that involves reading and interpreting raw contextual data to develop themes.
2. **Axial coding**, where categories are refined, developed, and related to other codes.
3. **Selective coding,** where the 'core category' or central category that ties all other categories in the theory together into a story, is identified and related to other categories.

After coding, the raw data and disorganised results are organised and consist of important codes of concepts, which are linked to each other, and a network emerges. In addition, quotations will be used, and all of this together will form the narrative of the results.

3.4. Data Analysis Method

To collect the right data and interpret results in this study, the data analysis methodology is therefore important and organised as follows: First, all amenities within the target area are categorised into specific groups, for example living, working, commerce, healthcare, education, and entertainment, based on existing literature. This makes it possible to assess each amenity of every category that is within or outside the 15-minute radius. This assessment will be done through 'My Google Maps' by making circles from a central point of the neighbourhood. The operationalised distance of 1.2 km walking and 3 kilometres cycling serve as determinants that determine whether the neighbourhood meets the criteria of the 15-minute city, according to longitude, as this is the average distance that an average individual from Woensel West can travel. Within this radius, the present amenities will be considered. If any amenity falls beyond this 15-minute radius and is absent in the research area, it suggests a potential need for them, besides the area does not meet the 15-minute concept.

Second, incorporating demographic data into the analysis provides insight into how effectively the 15-minute concept meets the needs of the local population, both currently and in the future—For example, proximity to supermarkets for daily necessities and facilitating social interactions by offering amenities. By combining demographic data and amenities within the 15-minute city radius, a comparison can be made between their accessibility in the neighbourhood when demographics are considered and when they are not. Additionally, by including demographics, future needs can also be predicted. Therefore, demographic data and social needs will be assessed according to design standards based on the national average to identify both current and future needs, with a strong focus on the current time with projections up to the year 2040. This comparison makes it to some extent possible to identify which demographic segments have greater or lesser access to amenities at the current time and whether there are enough amenities for specific segments within the 15-minute radius of the study area. Concerning the forecast within this research, a forecast in general, can be unreliable, especially in smaller areas compared to larger areas, especially due to radical changes, when concerning age groups moving within and outside the neighbourhood, sex, type of workers and ethnicity. Therefore, the forecast in this research will only regard the amount of population as being sufficient.

Furthermore, by analysing the 15-minute city concept with and without demographic data, it can be understood whether demographic factors affect the effectiveness of the concept, the allocation of amenities and the accessibility of the amenities in the area. During the coding process, attention is paid to interviewees' interpretation and codes are categorised based on themes that emerge. In addition, a survey is also distributed to the population

on the accessibility and satisfaction with amenities within the 15-minute city. Moreover, the survey is made by Microsoft Forms, as this is the program the municipality facilitates and wants me to use. This is due to the privacy policy of the municipality and the protection of the personal data of respondents. This survey is useful because it describes its results with descriptive statistics, and will dive into the satisfaction, presence, and accessibility of the amenities within 15 minutes of distance. These results confirm or reject the findings from the survey based on the design standards and reflect the accessibility of the specified amenities within 15 minutes for the residents. The results from the survey will be analysed as follows: per question, the different results are approached generally and copied 1:1 from the results screen. In addition, on the questions where accessibility is concerned, the results are approached in general, copied 1:1 and then by target group, to take a deeper look and see if there are differences between target groups based on how long residents have lived in Woensel West, but also if there are differences between residents of private dwellings and residents of social rented dwellings, concerning the accessibility of the amenities within walking and cycling distance. Based on the differences, or similarities that come out of this give insight into the extent to which amenities are accessible to certain target groups, and which are not. This can be done by going through the corresponding Excel file of the survey results and calculating these correlations. Besides, these averages will be statistically tested by conducting Chi-square tests, in which the answers “not applicable” are excluded to avoid a distorted picture. I will also analyse the geographical distribution of respondents in the survey area concerning their answers and whether there are any differences in this.

In addition, respondents are allowed to choose from 5 options for some questions: "very satisfied", "satisfied", not "satisfied", "not at all satisfied", and "not applicable/ don't know". The results are generalised into "satisfied", "dissatisfied", and "not applicable/ don't know". This makes it easier to know the proportions relative to each other. In addition, the differences between 15 minutes of walking and cycling are compared. Moreover, the coding process of the expert interviews will lead to the development of a coding framework, which shows what is considered relevant to the 15-minute city, the allocation of amenities, the accessibility of these amenities, the role of demographic data, local needs, and the method of investigating the area. Altogether, these data clarify and strengthen the understanding of the relationship between the concept of the 15-minute city, the allocation of amenities, the influence of demographic data, and addressing local needs from the results of this research.

3.5. Reliability & Validity

The previous sections have explained the operationalisation and methodology of this study. This section addresses the reliability and validity of this study and describes how it is ensured during this study.

3.6.1 Reliability

By Scheepers et al (2016), reliability is defined in terms of the accuracy and precision with which research or the measurement of variables should be carried out. This refers to the measurement instruments used in a study. Consistency says something about the repeatability of the study. If the research is repeated, the same results should emerge Scheepers et al. (2016). Within the social sciences, reliability and consistency are more complicated, as they deal with the principle of repeatability; under the same circumstances, the same measurement will lead to the same findings (Van Thiel, 2015). This is different in social sciences, as people are central as objects of research or data sources. This is because people learn from experiences, so repeating research on the same people will not always lead to the same findings (Van Thiel, 2015).

Therefore, since demographic needs are a part of this study, ‘needs’ are defined as the need for daily amenities based on design standards, and the survey in which amenities are desired within walking and cycling distance, combined with accessibility- and satisfaction results from the survey. However, these design standards are from a planning research bureau in the Netherlands and the municipality of Eindhoven. These amenities and design standards are based on research, per amenity, on Dutch averages, and dates from 2024. The reliability of this study

will be ensured because the design standards have been calculated by experts who formed grey literature are the reference for this research and is an internal data source. In addition, the replicability of the study will be guarded by the methodology and operationalisation per variable being replicable for other areas. However, the outcomes depend on spatial properties and context as mentioned before. Actual needs will also be measured by the inhabitants by a survey, in which 20% need to respond to let the survey be reliable (Dobronte, 2016). In the questions, the respondents will be filtered by relevance and made clear to which demographic group they belong and what their needs are according to the amenities within the proximity of 15 minutes of walking and cycling.

As the 15-minute city is a new theory, it has been applied in the policies of cities worldwide, including Utrecht and Eindhoven (Moreno et al, 2021; De Maat, 2021; Gemeente Utrecht, 2021a, Gemeente Eindhoven, 2024b). As the theory is young, the outcomes of its implementation are difficult to measure, as the concept is not operationalised the same everywhere (Knap, 2022). However, the operationalisation, and interpretation which is chosen for this research, align with the vision of the municipality of Eindhoven et al., (2024b), and is conducted by grey literature. Expert interviews will be for sharpening and fine-tuning this research. This is done physically to better capture the body language and interpretation of the interviewee per response and record the correct results. Validity and reliability will also be monitored through source triangulation in a way that is explained in the validity and reliability section.

In addition to the internal validity, it should also be noted that my interpretation plays a major role in this study. This is because I determine the allocation needed based on the prefixes for ‘amenities for daily needs’. Concerning external validity, I am dependent on the data available from databases at present and in the future. In addition, it should be kept in mind that during the research of determining distances to amenities, the methods may be discussed. This is because the centre point of the neighbourhood was determined by eye and not mathematically based on where the average number of residents live. Determining a centre point through this route is necessary as a basis for argumentation during this thesis. Moreover, the reliability of the forecast could be called into question by my skills as a researcher and allocating amenities based on available data for allocating amenities, based on design standards. However, the comprehensive justification will come in the results and discussion chapter through several examples that ensure the reliability of this study. Altogether, ensuring the reliability of the data lays a solid foundation for further analyses, but it is equally crucial to investigate whether these data measure the intended concept, thereby ensuring the validity of my findings.

To increase the reliability of results from the survey, it was decided to act within the possibilities to find the best method to increase attendance. This resulted in distributing the survey through the aforementioned methods with a response period of four weeks. Based on the turnout, its reliability was established. It was not possible to post letters on behalf of the municipality due to the lack of financial resources. Apart from turnout, time and financial resources as external factors, other factors that affect the reliability and turnout of the survey are the literacy and education of respondents, the language barrier of residents, and the need of residents to complete the survey (Interview 1; Interview 2). To ensure reliability, the question wording, the language of the survey, the language level of the survey (B1 Dutch) and the length of the survey were considered together with the municipality's policymakers and an area analyst. These factors are important because everyone should understand the survey and the wording should not be too difficult. Concerning the length of the survey, it should not be too long as people are less likely to to complete it (Interview 1; Interview 2). The research population size is 5.170, with the sample comprising 114 respondents. This allows for 90% reliability and 10% margin of error.

Moreover, because the survey asks for accessibility by target group and the target group sizes differ with the corresponding results, it is necessary to do a statistical test to monitor and ensure the reliability and validity of the survey results by target group. First, as there are four different nominal target group sizes and two nominal

categorical responses in the results for the accessibility component: ‘yes’ and ‘no’, I choose Pierson's Chi-Squared Test on this basis. This test is scientifically used to compare observed frequencies with expected frequencies and checks whether the observed and expected frequencies are statistically significant (different from each other) (Field, 2009, p. 688). Here, it is necessary to go through several steps to perform the test for reliability.

To perform the Chi-squared test reliably, the first step is to set hypotheses is necessary. Next, Chi-squared values of the observed and expected frequencies are calculated. After that, it is necessary to determine the critical value (α). In my study, this is 0.05 (5%). Next, the Chi-squared values are compared with the critical value. If the Chi-squared value is greater than the critical value, then hypothesis H0 is rejected (Field, 2009, p. 697). There are some conditions that the Chi-squared must satisfy to perform the test properly and ensure the reliability of the results. First, the data should be categorical. Second, the observed frequencies should be independent of each other. Third, the expected frequencies should not be smaller than 5, according to Field (2009, p. 690). However, it is acceptable in larger contingency tables to have up to 20% of expected frequencies (Field, 2009, p. 692). If this 20% is exceeded, it affects the accuracy of the test concerning the survey results.

3.6.2 Validity

Regarding the validity of research, validity is about that the results of the research should match reality (Scheepers et al. 2016). This means that the results found must be consistent with what is actually being researched. In other words, what you intended to measure was actually measured (Scheepers et al. 2016). Therefore, we speak about internal and external validity. Internal validity is important because I need to be sure that the manipulation of the independent variable caused the change in the dependent variable (Merkus, 2022). External validity is the extent to which the findings of research can be generalised and used in a broader context (Merkus, 2022).

However, Internal validity is ensured with the choice of using characteristics from demographics, design standards, and the number of amenities concerning the theoretical framework of the 15-minute concept in addition to the literature. Expert interviews with the policymakers and local experts are used to confirm, and sharpen the research method, hence adding triangulation. More specifically, triangulation will be added by confirmation of the research method to find out the needs of inhabitants, the formation of the survey, the theory behind the allocation of amenities and the use of demographics and design standards. Moreover, triangulation will also be added by the local experts. This is done through confirmation of the research findings about the present amenities within the area, the local needs and if they match with the outcomes.

The deepening of needs is done by demographics and design standards as a method, to estimate the type of amenities and demonstrate the results on the one hand. Conversely, a survey is done and expert interviews to reinforce the results. However, it is important to note that it could be a good addition for substantiation; however, it is not required to explore the scope of this study. In addition, explicitly these design standards which are used are not binding to what extent reality should exactly mirror these standards, but the chosen design standards are the most feasible and reliable. Moreover, it perhaps gives some concreteness to the need and steers towards a more desirable practical outcome. In addition, the results possibly say something about social needs, since the 15-minute concept does not include standards and concreteness.

Therefore, it is important to ensure what analysis technique was used in the research and whether this analysis leads to the results I intended to acquire. Here, I need to ensure that statistics is not the end, but a means to the success of the research (Van Thiel, 2015). Thus, external validity is ensured in this study because extensive consideration was given to which analysis best suits this study. In doing so, the method is generalisable and can be used in wider contexts. In addition, the 15-minute concept was chosen as the theoretical framework and design standards of the research firm used by the municipality of Eindhoven as a reference for their policymaking. This is

also used within the methodology of the scope of this study, combining qualitative data and statistics. As these scientific and practical methodologies within sociology and spatial planning are also used in similar case studies, this choice arose and was appropriate and is tested to be a worthy addition to the 15-minute city concept. The methodology used during this study can be generalised. So, using demographics, design standards, doing interviews and surveys.

However, the content and results from this research depend on what it is used for. The content of the demographics and design standards are local, as the demographics are from Woensel West, and the design standards are based on research in Eindhoven, based on Dutch averages. To ensure the validity of the survey being carried out, it is important to consistently measure what must be measured and ask the questions based on the purpose of this study (Benders, 2022). First, the concepts from the literature were operationalised to ensure content validity and concept validity and to use them in the survey. In addition, the questions were drafted in consultation with an expert that make up the survey ensuring internal validity, to optimise the reliability of the results for subsequent analysis. Regarding external validity, the sample size must be large enough and as described under methods, there are several ways to achieve this, within the possibilities. As the strategy from this research is described, it is time to explain the results found.

4. Results

This chapter will discuss the main findings of this research, based on the previously described chapters, using the strategy, purpose, methods and operationalisation as discussed.

Firstly, contextual information will be outlined to give an idea of the research area on which this study is based on. By doing this, sub-question 1 will be answered. Second, the results from the research will be given to what extent the neighbourhood meets the 15-minute concept concerning the existing literature. Third, the results are explained to what extent the amenities are present in the area. These results address the demographic amenity needs based on design standards and allow the quantity of supply present to be assessed against the national average. Finally, sub-question 4 will address the local needs of the community through a survey and interviews with the management of the community organisation. Concerning these methods, the results will make clear what the satisfaction, the accessibility of the amenities offered, and the needs are of the local community, concerning amenities. This will give insight into what amenity is wanted, by who and what these needs tell about the outcomes from the design standards.

Altogether, the results from these questions form the answer to the main research question according to the scope of this research. To sketch the local situation, it is important to know where it is located, what its history is and how the situation is in current time.

4.1. The context of Woensel West

In this paragraph, the results will be explained to answer sub-question 1. As Woensel West is the case of this case study, it is important to know where this study concerning the 15-minute city is based. In addition, the societal relevance of this research is explained in the context of this neighbourhood which forms the basis in which the strengths and limitations of the concept and research are revealed.

Since amenities and demographics are location-dependent, it is important to understand these and the local context, so that the advice and outcomes from this research are appropriate and relevant. First, the background of the neighbourhood will be explained, whereby the history of the neighbourhood is explained up to now. From this point of view, the cause of this research will be clarified, while the 15-minute city, liveability and demographic needs are central. How the needs and amenities are monitored will also be discussed. Finally, demographic segmentation is covered and then the importance of neighbourhood organisation.

To arrive at the results below, grey literature was used, databases on demographic data, and interviews were held with the neighbourhood organisation. During these interviews, the local experts were asked about the context of the neighbourhood, their participation was discussed to improve the neighbourhood and why this is relevant, but also their methods to place targeted amenities in Woensel West. Here it is important to know why participation is important, and how they involve residents in allocating amenities in the neighbourhood. Altogether, this gives insight into how they improve liveability and what this contributes to the extent to which the neighbourhood meets the 15-minute city.

4.1.1. Background Nowadays

Currently, Eindhoven is growing as a city with the arrival of 40,000 homes within its city limits due to the success of the Brainport region, among other things, Woensel South is doing relatively poorer (Pact Woensel Zuid, 2023a). The district Woensel South has neighbourhoods with outdated housing, where people with all kinds of problems live close together.

Likewise, many people struggle to make ends meet, and young people grow up with relatively fewer opportunities than young people from other neighbourhoods in Eindhoven. They also struggle to develop their talents and find work or a day job that suits them (Pact Woensel Zuid, 2023a).

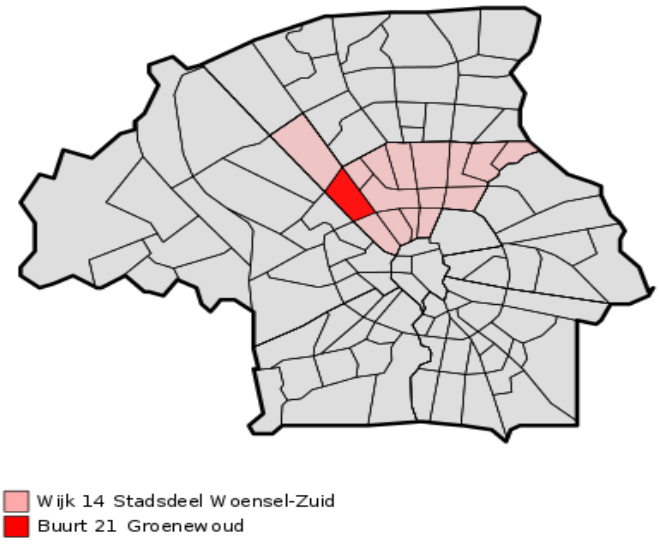


Image 5 Woensel West/ Groenewoud (CBS, 2008)

For example, Woensel West. Woensel West is officially named 'Groenewoud', as Image 5 shows, and is in the Woensel South district, on the east side of the train track and the north side against the centre of Eindhoven (Buurtonderneming Woensel West, 2018; Google Earth, 2024; Pact Woensel Zuid, 2023a). The neighbourhood is known in Eindhoven as a working-class neighbourhood with a poor image and has therefore been characterised for some time as a focus area for improving its liveability (Eindhoven et al., 2020; Buurtonderneming Woensel West, 2022; Pact Woensel Zuid, 2023a). It has a history in which a lot happened that affects the local liveability during time.

Image 6 Woensel West from above (Google Earth, 2024)

4.1.2. History of the neighbourhood concerning the local community and liveability

Historically, Woensel West was largely built in the 1930s-40s. The strong growth of the current multinational Philips, which originated in Eindhoven, created an influx of workers and a high demand for housing at the time (Architecture Centre Eindhoven, 2021). From 1924, Philips and the municipality took the lead in developing workers' housing. However, in the 1960s and 1970s, workers left the neighbourhood in large numbers, as many had become

redundant due to the emerging processes of automation in the factories. Therefore, they made way for the arrival of immigrant families attracted by the available working-class housing with low rents (Architectuurcentrum Eindhoven, 2021).

From the 1980s onwards, the living environment in Woensel West deteriorated and reached a low point when for years it was characterised by trafficking, nuisance, and prostitution (Architectuurcentrum Eindhoven, 2021; Van Der Lans, 2017; Buurtonderneming Woensel West, 2022; Platform31, 2023). It caused Woensel West to be listed as one of the 40 worst neighbourhoods in the Netherlands in 2007, despite a substantial renovation and demolition operation carried out in the 1980s by the then-housing corporations. The municipality of Eindhoven therefore decided to undertake the neighbourhood in 2002. Demolishing and building alone proved not to have enough impact to structurally improve the neighbourhood's problems, change its image, and help residents move forward.

Therefore, from 2011, the focus shifted to neighbourhood residents, with the municipality of Eindhoven, residents' organisations and the local housing corporation working together with a different mix of measures on social, economic, and physical measures (Architectuurcentrum Eindhoven, 2021; Buurtonderneming Woensel West, 2022; Van Der Lans, 2017). One initiative is 'buurtonderneming Woensel West' or the neighbourhood organisation that was initiated in 2009 it has had a big influence on the transition of Woensel West enhancing its liveability, reducing local problems, and and meeting local needs.

4.1.3. Neighbourhood organisation Woensel West

Since the initiation of the neighbourhood organisation, Woensel West flourished from a vulnerable area to a safer neighbourhood where children play in the streets again and where a remarkable number of volunteers are active (Platform31, 2023; Interview 3; Interview 4). In Woensel West, even the most volunteers in Eindhoven are active, compared to other neighbourhoods (Platform31, 2023). The Neighbourhood Organisation Woensel West is an independent organisation set up by the municipality of Eindhoven and the local housing corporation, named Trudo, to realise the goals of the neighbourhood approach.

As a result, the neighbourhood organisation is run by two seconded employees, namely a programme manager from Trudo and an area coordinator from the municipality of Eindhoven who together form the management of the organisation (Platform31, 2023). The neighbourhood organisation ensures improved liveability in the neighbourhood by providing various measures, both physical amenities and social amenities, tailored to the environment and the residents, to connect residents and provide for their needs (Platform31, 2023; Interview 3; Interview 4). In doing so, neighbourhood organisation has several methodologies that are proving successful to date, namely through an 'insertion programme', by making real estate available for certain amenities, or people that contribute to the neighbourhood, and by organising events for certain populations to live in the area (Platform31, 2023; Interview 3; Interview 4). These could be events, for example by tutoring for young and old, financial help, consultation hours with the housing association, mental help, a cultural event such as Iftar during Ramadan, a theatre and more (Interview 3; Interview 4).

With these methods, the organisation aims to provide enough amenities through participation to benefit different needs at the individual level, but also at the neighbourhood level and needs that are multiple in the neighbourhood at the individual level (Interview 3; Interview 4). They are described in more detail in the following paragraphs.

Insertion programme

Because of an increasing concentration of vulnerable people in the neighbourhood, the neighbourhood organisation wanted to counter this problem. Therefore, together with the local housing corporation Trudo, it designed a programme with the objective that new tenants would positively contribute to the neighbourhood and

counter this trend. The selection of new inhabitants was not based on income but on motivation and contribution to the programme (based on experience and education amongst others). Thus, the insertion programme was born. Placed residents are new residents in the neighbourhood who rent a house from the local housing corporation. The housing corporation chooses a lower rent than usual for these houses on the condition that each inmate contributes 10 hours a month to one of the neighbourhood organisation's projects. The volunteers perform their tasks under the guidance of professionals. The boarded-up volunteers make up much of the activities set up by the neighbourhood organisation and in practice act as role models for children. As the programme manager claims:

> *"The insertion program was started. Like: what, if there are people who are willing to invest time and energy in the neighbourhood if we allocate them houses with the agreement that they will have a lower rent? We never talk about rent reduction ourselves, because the rent is just the rent of the property as it is. So, we determine whether the rent is a bit lower or a bit higher, but those (inserted residents - from a different demographic segment, or other contributors) get a lower rent in exchange for that... And that lower rent is not even often decisive. But the fact that you can rent housing in Woensel West outside the allocation system, instead of queuing for ten years, is an even much bigger argument. So then: yes, you can demand something in return if you offer people that opportunity."* (Interview 3)

Based on this quote, it shows that they are actively weighing up the interests of the residents and looking at what the housing association believes best suits the residents who help them with certain problems that arise in the neighbourhood. This does not require much effort in the current housing market as there are long queues, according to the programme manager. However, making properties available is also a useful method (Platform31, 2023; Interview 3).

Making property available for users and activities

Since the initiation of the neighbourhood organisation, it was soon clear that it needed to house itself in the neighbourhood. Housing for the many activities the community organisation later organised is important. However, an event can still be organised outside, but for structural programmes you need amenities. The municipality and social housing corporation Trudo played an important role in making real estate available and relatively affordable for occupant amenities, or events that contribute to the neighbourhood, by realising a centre which is committed to Play, integration and learning, for the young and old. Besides, the neighbourhood workroom (the community centre) was facilitated, which now offers a wide range of amenities, and services as the following quotes of the local experts mention:

> *"The neighbourhood workroom (the community centre) is a meeting location for vulnerable residents and is also managed by vulnerable residents (people who have a lower income and experience economic difficulties). In addition, there's a standard consultation hour from the housing association, there's a consultation hour from 'Workplace Finance' (financial support organisation), there's in the course of GGZE (mental healthcare organisation) well, so that that varies enormously."* (Interview 4)

It shows that the community centre offers space for multiple destinations and services. these can be things for personal assistance. But also for entertainment, which is evident from the following quote.

> *"That's (activities and events in and through the community centre are) about language, maths, but that's also about culture, sports, exercise, dance theatre that's a whole palette of activities that children participate in."* (Interview 3)

Besides, the neighbourhood organisation also pushed for affordable real estate for start-ups and other amenities in the neighbourhood, for example healthcare and education. However, establishing a good base by bringing back security and ensuring an attractive business climate were factors with a high priority to make Woensel West attractive for organisations to settle. Therefore, Trudo does this for example by facilitating small areas for special shops that meet local needs and contribute to the neighbourhood through certain concepts, and contribute to the neighbourhood and its variety of inhabitants (Platform31, 2023; Interview 3; Interview 4). In addition, a business coach was also offered from the neighbourhood organisation as guidance for entrepreneurship, to make the flourish again, and to help the organisations provide needs and entertainment. Moreover, the business coach helped boost employment opportunities for the local community. Cooperation between organisations is the best way to monitor residents' amenity needs to respond and continue to meet them, as the next quote suggests. Finally, the neighbourhood approach makes the most sense provided residents are involved (Interview 3; Interview 4).

> *"I see it (my function) myself mainly as the bridge from inside to outside and from outside to inside (being the contact between residents and organisations). There are some things in there that you see everywhere, independent of the area. It is a piece of signalling function for the municipality to act on the local situation, connect inhabitants, and help with certain initiatives whereby people come to me first to arrange permits amongst others, but the role is also broader in practice. I notice when people get stuck in processes or are dissatisfied with something, it mainly comes to me as well. They come to me with all kinds of initiatives that residents can have, so that can be about green spaces or activities, or yes, as broadly as possible!" (Interview 4)*

Collaboration

As mentioned earlier, people have been active in the neighbourhood for many years and the cooperation between the municipality of Eindhoven, the neighbourhood organisation Trudo, and other parties by allocating amenities for residents to improve the neighbourhood.

> *"Not only bringing back security but also improving the neighbourhood as a whole. Of course, the collaboration must keep that safety under control and that remains a vulnerable issue, but I could say that we have managed to keep that manageable. So that those nuisance issues are always there, but it's no more than in other* neighbourhoods." (Interview 3)

As a result, it was successful to improve the neighbourhood and its business climate, offering space for amenities to even further improve the neighbourhood with a variety of amenities that automatically contribute to the 15-minute concept as well.

> *"So, I know that Trudo, they did start that pretty quickly to get businesses, small-scale entrepreneurs, small businesses in there in Edisonstraat. I also knew at the very beginning that that was quite a job, to get businesses for that. And now there is a waiting list of businesses who want to settle in Woensel West."* (Interview 4)

In addition, several residents organise sports events through a neighbourhood sports club. From its inception, the neighbourhood organisation worked with residents. For instance, "board members" of the neighbourhood organisation were directly linked to existing activities to manage these events and involve local residents. The residents' association also has a seat on the board of the neighbourhood organisation. In addition, the neighbourhood organisation continues to engage with residents when it comes to major changes in the neighbourhood, e.g. demolition and new construction projects. (Platform31, 2023).

"So, we have a living room (the community centre for example) for that. So again there are a lot of activities organised (by organisations and volunteers). We just had the neighbourhood Iftar. But despite the bad weather, as many as four-, five hundred people went. That was gigantic though. That's another one of those activities where we try to get all those people together, that they get to know each other" (Interview 3)

Another example of their participation and facilitation according to demographic needs are indicated by the area director in the next quote:

"And yes, there is also something the sports director does, because we also have to include those students. There are of course all kinds of arrangements to get the students to land well in the neighbourhood and one of the things we did last summer; We built a, for example, a beach volleyball court." (Interview 4)

Due to these collaborations and methods, it is relevant for this research to interview the neighbourhood organisation to find out the needs of Woensel West residents regarding amenities in the neighbourhood, within 15 minutes of walking and cycling concerning the population groups and thus demographic segments. The results of these interviews in terms of needs and amenities are presented in Chapter 4.4. Table 6 shows schematically the organisational structure that demonstrates the relevance of the interviewee. More methods of cooperation are shown in Appendix 6, along with results that give better insight into the local situation.

Table 6 Structure neighbourhood organisation (Platform31, 2023; own work)

Board				
Trudo	Municipality	Residents' organisation	Independent chair	
Management				
Programme manager Trudo		Area director municipality		
Rental contracts				
Vocabulary coordinator (kids)	Vocabulary coordinator (Adults)	Living room kids plus (extracurricular)	Coordinator inserted programme	Etc.

As many methods have been explained and possible how the liveability of the neighbourhood has been improved and is monitored to ensure it does not deteriorate, it should also be noted that liveability is a broad concept.

4.1.4. Liveability, needs and the importance of participation in Woensel West

This is because liveability is subjective about how an individual or group perceives the environment, i.e. determined based on local needs, it is necessary to participate with residents to provide appropriate offerings that match their needs. By providing needs-based help at the source of the problem, overall liveability could improve for the individual and others, when it comes to nuisance, for example (Interview 1; Interview 2; Interview 3; Interview 4). Conversely, residents could also need entertainment amenities, or a doctor within a 15-minute' walk for people with mobility problems, so liveability is very specific, but simultaneously subjective, related to a particular aspect of liveability (Interview 1; Interview 2; Interview 3; Interview 4).

Without the facilitation of physical amenities, social amenities, services, products, or activities are also not always possible (Platform31, 2023; Interview 3; Interview 4). For example, placing healthcare amenities, for example the doctor and pharmacy, a primary school, or a community centre on one side, is of great importance for the facilitation of social (non-physical) needs on the other side. As a result, this facilitates certain target groups to connect or offer help with both individual and local problems and needs. In Woensel West, this is done through constant coordination by cooperating organisations (Platform31, 2023; (Interview 1; Interview 2; Interview 3; Interview 4). As a result, meeting needs through amenities and thus contributing to the neighbourhoods' or individual liveability is context-dependent and requires customisation of the demographic scale and segmentation (Interview 1; Interview 2; Interview 3; Interview 4).

4.1.5. Demographic composition of Woensel West

This section discusses the demographic segments of Woensel West, to provide a better picture of the neighbourhood's demographic structure, also in comparison to Eindhoven's population. Demographic characteristics could be used to better identify needs when it comes to appropriate amenities in the neighbourhood using the 15-minute city concept, as well as factors that strengthen further outcomes. Demographic characteristics also provide insights that can be considered during the further implementation of this study and the formation of the survey.

Population

First of all, Woensel West represents 2.1% of Eindhovens' total population and consists of 5.170 inhabitants. Between 2013 and 2023, the neighbourhood experienced a population growth of 26%, from 4.090 inhabitants to 5.170 (Allecijfers, 2024; Eindhoven.incijfers, 2024). Such growth has a great effect on the amenities of the neighbourhood and the surrounding area (Interview 2). Looking at the age distribution in Eindhoven and Woensel West, Woensel West has an above-average group living between the ages of 20-29-year-olds and 30 to 39-year-olds, as shown in the figure below (Allecijfers, 2024). The 40- to 89-year-old groups are less represented in Woensel West compared to the Eindhoven average (Eindhoven.incijfers, 2024). As a result, it can be said that the neighbourhood is relatively young compared to the Eindhoven average. Furthermore, the neighbourhood has 2765 households over its 5.170 inhabitants, which works out to an average size per household of 1.9 people (Allecijfers, 2024; Eindhoven.incijfers, 2024).

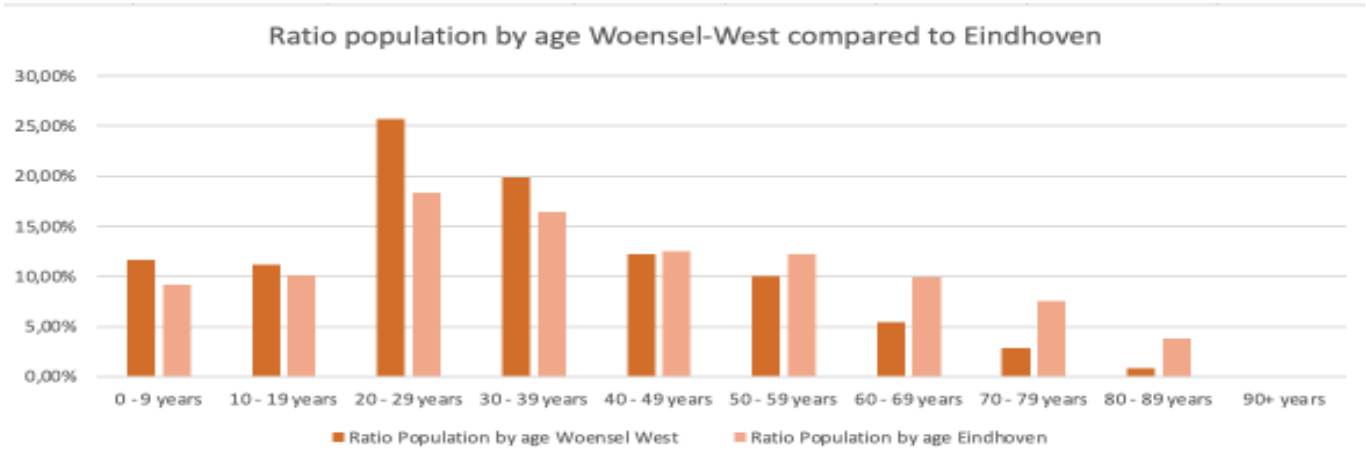


Image 7 Population per age in comparison to Eindhoven (Research institute Het Pon & Telos & Gemeente Eindhoven, 2024; Allecijfers, 2024; Eindhoven.incijfers, 2024)

Education level

Concerning the education level, it is good to know the education level, as it may contribute to the language that will be used in the survey, but also that it may also influence the monthly average income within the neighbourhood.

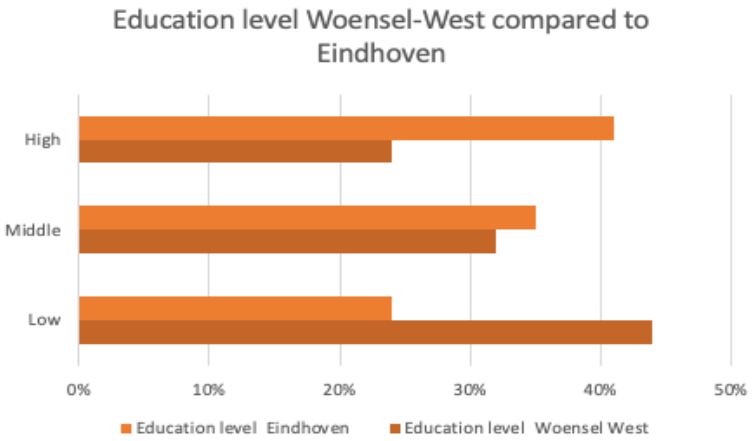


Image 8 Distribution of education level in Woensel West in comparison with the average of Eindhoven

As we look at Image 8, the educational level in the neighbourhood is distributed in the following way in the neighbourhood; The largest group in Woensel West is low-educated (44%), followed by the medium-educated people (32%) and finally the smallest group of highly educated people in the neighbourhood who have a bachelor's degree or higher. Looking at the urban average, the neighbourhood shows that there are relatively many low-educated people in Woensel West (44%) compared to the

Eindhoven urban average (24%). The group who are middle-educated is almost the same, with the share of middle-educated people in Woensel West being below the urban average, 32% versus 35% (Research institute Het Pon & Telos & Gemeente Eindhoven, 2024; Allecijfers, 2024; Eindhoven.incijfers, 2024). These findings mean it is better to make the language of the neighbourhood too difficult while conducting the survey that is carried out. Besides, this can mean that within the area, on average the income is not high, in combination with a high amount of social housing.

Income

As the results show, many people live in Woensel West with a relatively low income, compared to the Dutch average (Van Der Lans, 2017; Allecijfers, 2024). The average income per person in the neighbourhood is €25.400 per year (Allecijfers, 2024). This is based on 31.400 euros per income recipient. The neighbourhood has 3.600 income recipients out of 5.170 inhabitants. In contrast, the Dutch modal income in 2024 is €44.000 according to CPB (2023). In addition, the employment rate is slightly below the national average, which is 73.1% in the fourth quarter of 2023, according to CBS, (2024). In Woensel West, this is estimated at 70% in 2023. These results show that a significant proporation of people have below-modal incomes on average, which impacts the amenities that need to be provided in the neighbourhood. These amenities can quickly become too expensive and less accessible. Consequently, many of these individuals also live in social housing.

Social Housing

Looking at the house types, Woensel West consists of a high proportion of socially rented housing, namely 61%. This is substantially higher than the urban average of 37% (Allecijfers, 2024). Dutch municipalities aim to locate 30% of social housing in their cities (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023).

However, neighbourhoods with a relatively high proportion of socially rented housing are more likely to have liveability problems (Rigo Research and Advice & Aedes, 2018). This is because social housing is relatively more likely to house residents with (multiple) social problems, which manifest themselves in the neighbourhood (Rigo Research en Advies & Aedes, 2018). From the literature and practice, one strategy to reduce problem areas in the neighbourhood is targeted gentrification. This creates more mixing by situating new housing and amenities in the neighbourhood to make it more attractive to other groups (Uitermark et al., 2007; Interview 3; Interview 4). As a result of the allocation of housing in the private-sector housing segment, a relative reduction of social rented housing in the neighbourhood occurs, this is also the case in Woensel West (Uitermark et al., 2007; Neighbourhood organisation Woensel West, 2022; Van Der Lans, 2017).

> *"Woensel West is not just social housing, there is 30 per cent is just owner and occupier, owner mostly. And yes, they are in a different category, so the neighbourhood is also differentiated. A different influx, Yes, look, we control that process (gentrification)"* (Interview 3).

As the programme manager implies, gentrification is indeed a strategy to reduce problem areas and place residents who contribute to the neighbourhood (the insertion programme). Trudo can do this as they own a lot of housing, and can manage and improve liveability by changing the demographic composition, meeting local needs and reducing the liveability problem at hand. Based on these results, this allows us to conclude and answer sub-question 1.

4.1.6. Partial Conclusion

To answer sub-question 1: *"What is the history of Woensel West, the current situation, concerning its liveability, and demographic composition?"* several data sources were examined to reach the following conclusions.

First of all, Woensel West is a neighbourhood that has had liveability problems for a long time. The demographic changes, (radical) economic changes, and crime, amongst others in the past, made the neighbourhood a place where many other problems converged and negatively affected the liveability of the neighbourhood. According to demographic data, the share of social housing is high compared to the Dutch and municipal average. The neighbourhood mainly houses above-average low-educated residents with below-average salaries and inhabitants who are on welfare. In addition, as the literature confirms, it is possible that the amount of social housing increases the likelihood of varied liveability problems in Woensel West. Hence, this makes it important to meet these needs to reduce these problems.

As a result, for around 20 years measures have been taken by Trudo, the municipality and the neighbourhood organisatino amongst others, resulting that the local liveability has improved, and the offer of amenities in Woensel West is controlled, according to various needs through the inseriton program and making real estate available whereby the participation with the community stands central. As a result, a lot of social initiatives took place, and are still taking place in the neighbourhood which are eventually often organised by the local community. This shows a degree of togetherness, which was not present in the past. Besides the allocation of amenities through controlled facilitation and insertion policies, the construction of new houses, bottom-up initiatives, and changing regulations for businesses, changed the image of the neighbourhood. As a result, the neighbourhood became an attractive place for organisations and people from different demographic segments to settle, leading to controlled gentrification. This change in the demographic composition reduced the existing problems in the neighbourhood. In this case, gentrification also is a considered, and monitored measure, through adding amenities and volunteers by the insertion program, attuned to the needs of several demographic groups. However, gentrification does not solve every individual's problems, but it can improve the overall liveability of the neighbourhood by creating a different demographic composition.

To answer sub-question one, the liveability of Woensel West was in a relatively poor state due to various causes, examples are crime and unsafety, which made no one eager to live in the neighbourhood. But the neighbourhood has improved significantly over the past 20 years through cooperation and the allocation of amenities tailored to local needs, particularly through allocating the primary school, healthcare amenities, amenities for social meetings, sports amenities and local shops attuned to different demographic segments. Through the engagement of the inhabitants, the safety that returned and the returned attraction of the neighbourhood for people and amenities, this implies the importance of a bottom-up approach and participation to place amenities in a neighbourhood to improve its liveability and its attractiveness. However, while controlled allocation and insertion takes place, it is important to examine whether and to what extent the neighbourhood meets the concept of the 15-minute city and to examine the extent to which the amenities offered are varied. Therefore, the next chapter elaborates on the presence of each amenity within a 15-minute walking and cycling radius. By assessing the presence of certain amenities, it is possible to make a statement about the contributions of the 15-minute concept, as claimed by the current literature.

4.2. The extent of Woensel West meeting the 15-minute city concept concerning amenities

This paragraph assesses which amenities in Woensel West fall within a 15-minute walking and cycling distance, aligning with the 15-minute city concept. To achieve this, amenities within a 15-minute radius from a central point in the neighbourhood were counted using Excel and marked on My Google Maps. This central point represents the average distance for the average resident. Image 9 provides an overview of the amenities within 15 minutes of walking and cycling from the neighbourhood's central point.

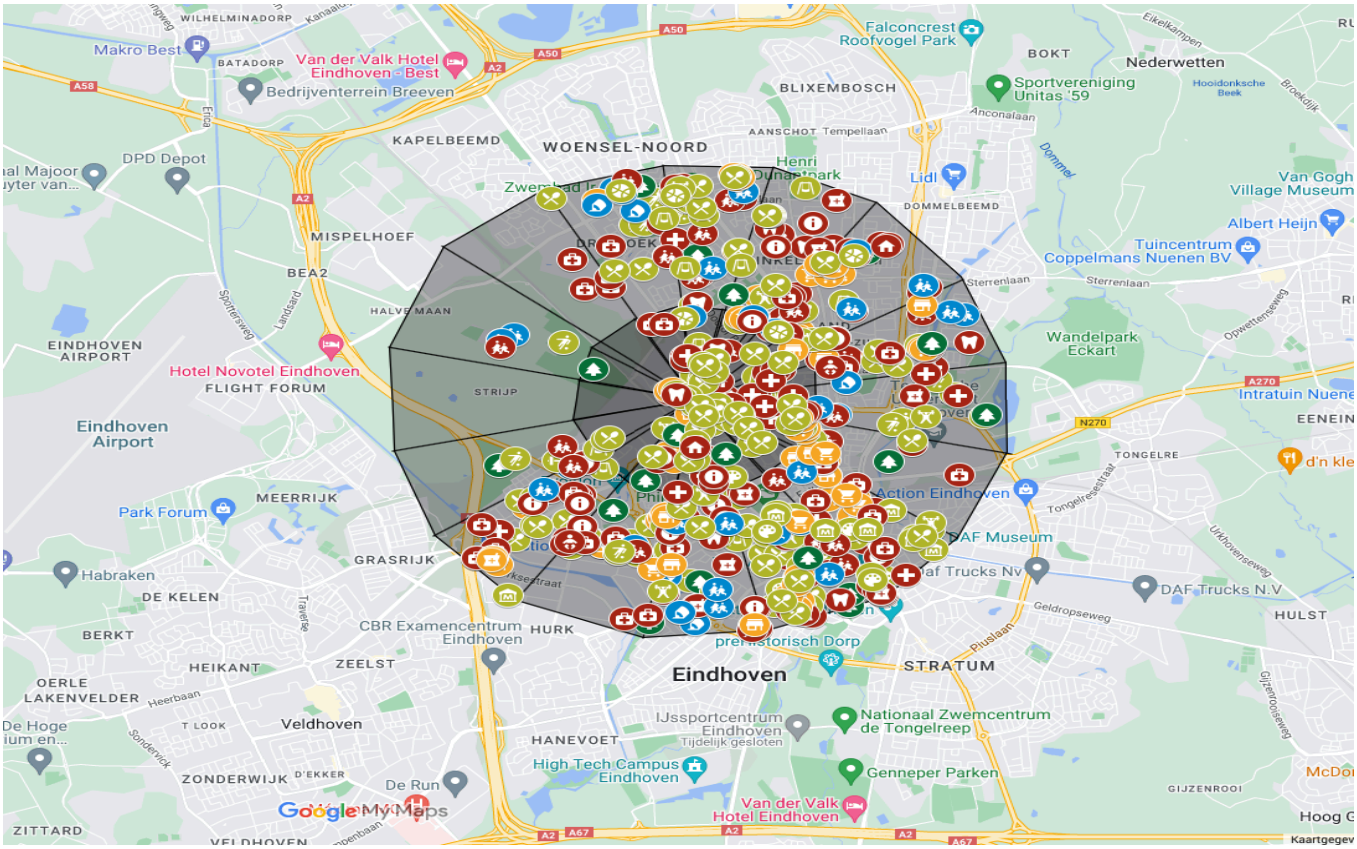


Image 9 Amenities within 15-minute walking and cycling distance from Woensel West (own design; My Google Maps, 2024)

Enlarged images of the amenities are shown in Appendix 7 The map can also be accessed via the following link: *https://www.google.com/maps/d/edit?mid=1zwio6NuJaggfxCOBTy6RhY4HAOLSmhA&usp=sharing*

4.2.1. Explanation of the Table

The image of the map is a bit cluttered and may be confusing. Therefore, Table 7 shows the amount of the amenity types. This table shows the operationalised categories in column 1: commerce, healthcare, public transport, entertainment, green spaces, and education. The amenities that are considered in this study are shown in column two under the corresponding category. Column three counted these amenities within walking distance and column four within cycling distance. The amenities within cycling distance also include the amount of amenities within walking distance, as the amenities within walking distance are also within cycling distance.

4.2.2. Results

First of all, the results of this study show that the Woensel West neighbourhood facilitates all amenities which are stated by the literature about the 15-minute city, except for walking, when we speak about outdoor sports accommodations. However, the extent to which each amenity occurs varies, as some amenities are more specific or more common than others, as the literature also claims. For example, a café is more common than a train station, museum, or local park, because there is a certain appeal, capacity and practical size that makes people willing to travel further the more specific an amenity is.

Table 7 Amenities within the 15-minute walking and cycling distance.

Type of amenity	Distance from centre to....	Amount of facilitated within walking distance	amount facilitated within cycling distance (walking + cycling)
Commerce	Supermarkets	7	34
	Drugstore (Personal care shops)	1	31
	Other daily retail	14	94
Healthcare	Doctor	17	58
	Pharmacy	4	22
	Dentist	6	39
	Physiotherapist	22	97
	Obstetric	7	13
	Consultation office (for 0-4 y/o)	2	5
	Childcare centre (0-11)	6	54
	Community centre	8	24
	Mental healthcare (GGZ in Dutch)	6	29
	youth centre	5	9
Public transport	Bus stop	8	no data
	Trainstation	1	2
Entertainment	Hospitality: Café, lunchrooms, restaurant etc.	97	532
	Gymnasiums	5	11
	Gym	2	10
	Playgrounds (small & big)	54	230
	Outdoor sports accommodations	0	19
	Museum	2	10
	Exhibition space	4	19
Green area's	local park	5	18
Education	Primary education (4 - 11 y/o)	6	25
	Secondary education (12 - 18 y/o)	1	9

4.2.3. Partial conclusion

To anwer this question, all amenities within walking and cycling distance have been marked and counted, where the following conclusions can be made. To answer the sub-question, "To what extent does Woensel West meet the 15-minute concept concerning amenities?" The literature states that the environment meets the 15-minute city if all amenities are present. Based on the literature, knowing that the concept makes no distinction between walking and cycling, the results concerning the supply of amenities present in Woensel West show that the neighbourhood meets the 15-minute concept for both walking and cycling, as every amenity is present, multiple times. However, it must be noted that huge differences are present between the amount of amenities present within walking and cycling distance, as the distance within cyclingdistance is way larger. Besides, large differences are visible between amenity types. The results show that relatively many more hospitality venues are present within walking and cycling distance, in relation to gymnasiums and doctors, for example. As these differences are such, despite the numbers, it is not clear whether this is much, little or somewhat a normal distribution of the supply available. This applies to both the current time and needs, and furure ones in which the population increases. In answer to the main question, the neighbourhood meets the 15-minute city according to the literature, however, it is unclear to what extent the neighbourhood meets and for whom, because the needs, numbers of amenities and their accessibility have not yet been measured. However, as a first step, the available supply should be assessed for presence using demographics and design standards and this is done in the next section.

4.3. The number of amenities present for Woensel West residents

To estimate and compare the amount of the present amenities in Woensel West, this paragraph uses design standards based on Dutch national averages, and demographics which are made insightful in paragraph 4.1. This will be done by calculating the extent to which amenities occur for each amenity type present with the number of inhabitants of Woensel West. The results from this calculation will be compared to the national average, to know if the present amenities are above, or below the national average, relative to the number of inhabitants. However, it should be noted that if an amenity deviates from the national average, this does not mean that there is a shortage or surplus. The national average shows a certain presence within the national market, and how many there currently are, related to the number of inhabitants.

These averages depend on the demand of the population on one side and the capacity of the market to provide their service at the time of determining the value, which is 2024 for the design standards used, as described earlier in the operationalisation. My expectation in general is that the amount of amenities within cities score above the national average when compared to the averages of amenities from non-cities, as the national averages also include villages and small settlements that often have fewer amenities (and inhabitants) than cities. If the score of an amenity is below the national average, it may indicate several things that are beyond the scope of this study. Examples could be that a lower capacity of the market is present due to a lack of needs, a lack of capacity from the market to provide the service or it could be an economic opportunity that could be exploited. This can also apply to above-average supply, where there may be a saturated market or a high need for these amenities. This situation however will be discussed in paragraph 4.4.

4.3.1. Explanation of the Table

Table 7, from the previous paragraph, is expanded by four columns in Table 8. The first column to the right of the count, column three, shows the number of amenities, and what it should be, based on the national average design standards. For each amenity type, these are the national average attendance per 1.000 inhabitants (and sometimes also per age group). Column 3 from the right, reflects what the desired amount would be according to the design standards based on the population of Woensel West. Columns 2 from the right and the last column are the counted amenities netted against the number of inhabitants of Woensel West for 15-minute walking and cycling distance. This offset was necessary to make a comparison with the desired number of amenities (the national average) from column four. The outcome represented how many amenities the inhabitants theoretically have at their disposal within a 15-minute walking and cycling distance. This outcome reveals the extent to which the number of amenities present scores against the national average.

Looking at these outcomes, which are marked by colour. Red indicates scoring below the national average concerning attendance. Yellow represents neutral. This was done because the literature does not distinguish between walking and cycling. In this table, I chose to mark scores neutral to indicate that these amenities score below the national average within walking distance. Since no distinction was made from the literature between walking and cycling, the presence is good, but in combination with the national average is insufficiently represented and these colours clarify which amenities are not, above- and below-average present within 15-minute walking and cycling distance. The amenities that were not coloured are a result of the fact that no data was available on these, so assessing them is not possible, but their presence is important.

4.3.2. Discussion

Concerning the results of the amount of amenities present, several are debatable. Firstly, no design standard was available for some of the amenities, which makes it difficult to make a substantiated statement about the amenity level present in Woensel West. This is also indicated in the table with ‘no data’. In addition, data for the age groups was missing to determine the amenities of primary education and secondary education. That is why assumptions

were made. The railway station is an urban amenity with national and international appeal, so it is important to know that this amenity is present within the 15-minute distance, but irrelevant to make a statement about it within the framework of this study, as described in the operationalisation section. Concerning the presence of bus stops, it is good to know the presence for assessing the amenities, however, there was no available data to make an exact statement. In addition, it was not possible to include the number of bus stops in the study within the scope of time and the results of this amenity did not decisively affect the scope of this study but would be complementary.

4.3.3. Results

This section deals with the results of sub-question three, which assesses the extent to which an amenity is present, for the number of inhabitants of Woensel West, compared to the national average. This is done for the years 2024 and 2040, to see what the changes are and what this means for the amenity present if the population grows and amenity presence remains the same. Hence, these results are important because they provide insight into the number in which supply is present.

2024

Table 8 The count and comparison with the national average of amenities available within 15-minute walking and cycling distance, 2024 (Own design).

Type of amenity	Distance from centre to....	Amount of facilitated within walking distance	Amount facilitated within cycling distance (walking + cycling)	National average per 1000 inhabitants 2024	The desired amount of amenities based on the design standards within 15-minute walking	Amount facilitated per 1000 inhabitants of Woensel West within walking range	Amount facilitated per 1000 inhabitants of Woensel West within cycling range (walking + cycling)
Commerce	Supermarkets	7	34	0,43	2,22	1,35606	6,587
	Drugstore (Personal care shops)	1	31	0,14	0,72	0,19	6,01
	Other daily retail	14	94	1,20	6,19	2,71	18,21
Healthcare	Doctor	17	58	0,48	2,48	3,29	11,24
	Pharmacy	4	22	0,13	0,67	0,77	4,26
	Dentist	6	39	0,52	2,68	1,16	7,56
	Physiotherapist	22	97	0,95	4,90	4,26	18,79
	Obstetric	7	13	0,06	0,31	1,36	2,52
	Consultation office (for 0-4 y/o)	2	5	1,30	6,71	6,15	15,38
	Childcare centre (0-11)	6	54	No data	No data	6,62	59,54
	Community centre	8	24	0,12	0,62	1,55	4,65
	Mental healthcare (GGZ in Dutch)	6	29	0,18	0,93	1,16	5,62
	youth centre	5	9	0,23	1,19	0,97	1,74
Public transport	Bus stop	8	No data	No data	No data	No data	No data
	Trainstation	1	2	No data	No data	Irrelevant	Irrelevant
Entertainment	Hospitality: Café, lunchrooms, restaurant etc.	97	532	3,50	18,07	18,79	103,06
	Gymnasiums	5	11	0,33	1,70	0,97	2,13
	Gym	2	10	0,33	1,70	0,39	1,94
	Playgrounds (small & big)	54	230	no data	No data	10,46	44,56
	Outdoor sports accommodations	0	19	0,95	4,90	0,00	3,68
	Museum	2	10	0,06	0,31	0,39	1,94
	Exhibition space	4	19	0,04	0,21	0,77	3,68
Green area's	local park	5	18	No data	No data	0,97	3,49
Education	Primary education (4 - 11 y/o)	6	25	4,43	2,58	10,31	28,03
	Secondary education (12 - 18 y/o)	1	9	0,47	0,42	1,12	10,09

From the results that are shown in the rightmost two columns of table 8, the scores are shown with the number of amenities divided by the population of Woensel West. This was needed to make a comparison with national averages. This was done using the calculation: number of total amenities from certain amenity type/ total population of Woensel West * 1.000 = presence of amenity on average per 1.000 inhabitants. The result represented the number of amenities per amenity type present per 1.000 inhabitants of Woensel Wests and can be compared to the Dutch national average values shown in column six, showing the desired amount.

Therefore, looking at the results shown in the most right columns, all amenity types are represented above average by ratio and absolute, concerning the national average based on Woensel West's situation. Within walking distance, however, eight amenity species score below the national averages regarding their presence. In many cases, this is compensated within cycling distances, except for outdoor sports accommodations, as these are also insufficiently represented within a 15-minute cycling distance. The results show that in many cases, the amenities are substantially higher than the desired amounts, and score above the Dutch national average when looking at the

amenities within walking and cycling distance. It can be suggested that many amenities are located in the neighbourhoods, and their environment, within 15-minute walking or cycling distance compared to the national average. This is explainable because the neighbourhood is located close to the city centre, and other centres; De Kruisstraat, Strijp-S and Woensel Shopping Centre, amongst others. These areas contain many amenities by themselves and in this respect, as the area is closely situated to these areas, Woensel West is well represented by the many possibilities of amenities within a 15-minute walking and cycling distance.

2040 forecast

Table 9 Forecast 2040: comparison with the national average of amenities available within a 15-minute distance. (own design)

Type of amenity	Distance from centre to....	Amount of facilitated within walking distance	Amount facilitated within cycling distance (walking + cycling)	National average per 1000 inhabitants 2024	The desired amount of amenities based on the design standards within 15-minute walking and cycling distance	Amount facilitated per 1000 inhabitants of Woensel West within walking range	Amount facilitated per 1000 inhabitants of Woensel West within cycling range (walking + cycling)
Commerce	Supermarkets	7	34	0,43	2,83	1,06399	5,168
	Drugstore (Personal care shops)	1	31	0,14	0,92	0,15	4,71
	Other daily retail	14	94	1,20	7,89	2,13	14,29
Healthcare	Doctor	17	58	0,48	3,16	2,58	8,82
	Pharmacy	4	22	0,13	0,86	0,61	3,34
	Dentist	6	39	0,52	3,42	0,91	5,93
	Physiotherapist	22	97	0,95	6,25	3,34	14,74
	Obstetric	7	13	0,06	0,39	1,06	1,98
	Consultation office (for 0-4 y/o)	2	5	1,30	8,55	6,15	15,38
	Childcare centre (0-11)	6	54	No data	No data	6,62	59,54
	Community centre	8	24	0,12	0,79	1,22	3,65
	Mental healthcare (GGZ in Dutch)	6	29	0,18	1,18	0,91	4,41
	youth centre	5	9	0,23	1,51	0,76	1,37
Public transport	Bus stop	8	No data	No data	No data	No data	No data
	Trainstation	1	2	No data	No data	Irrelevant	Irrelevant
Entertainment	Hospitality: Café, lunchrooms, restaurant etc.	97	532	3,50	23,03	14,74	80,86
	Gymnasiums	5	11	0,33	2,17	0,76	1,67
	Gym	2	10	0,33	2,17	0,30	1,52
	Playgrounds (small & big)	54	230	no data	No data	8,21	34,96
	Outdoor sports accommodations	0	19	0,95	6,25	0,00	2,89
	Museum	2	10	0,06	0,39	0,30	1,52
	Exhibition space	4	19	0,04	0,26	0,61	2,89
Green area's	local park	5	18	No data	No data	0,76	2,74
Education	Primary education (4 - 11 y/o)	6	25	4,43	no data	10,31	28,03
	Secondary education (12 - 18 y/o)	1	9	0,47	no data	1,12	10,09

According to future needs, as shown in Table 9, the forecast on the future level of amenities is based on demographic needs and is calculated based on projects realised in the future. Eindhoven's draft environmental vision describes that they want to locate the upcoming housing programme of 40.000 dwellings mainly at public transport lines and neighbourhood centres (Municipality of Eindhoven, 2024b). Woensel West is not located near any of the referred public transport lines or neighbourhood centres, which explains why relatively few new housing units will be in Woensel West until 2040. The draft environmental vision can be retained for this study, as it often does not change much, and the main lines almost always remain the same (Municipality of Eindhoven, 2024b).

Based on this source, and the internal data source of the municipality of Eindhoven (2024), it is shown by the data that the neighbourhood will expand by 759 dwellings. This is a growth of about 27% of the current number of households present in the area. The new dwellings are situated for a minimum of two persons, divided into flats and ground-level dwellings. Based on this data, I choose to calculate the future population based on Woensel West's current average household size of 1.9 with the number of houses added on top of the current number. As a result, this comes out to 6.579 inhabitants in Woensel West. As Interview 2 pointed out, it is necessary to assume something and this is my assumption. This calculation does not include the number of children that might be born, as I do not have the data to make a statement on this.

Looking at the results in Table 9, many cases show the amount of facilitated amenities within walking distance is not up to the calculated amount. Although the differences are not large concerning 2023, the differences are enough to fall below the national average in terms of the amount that is facilitated within a 15-minute walk. Relative

to the 2024 calculation, a negative difference is shown in the presence of the pharmacy, physiotherapist, consultation bureau, mental healthcare (GGZ in Dutch), youth centre, hospitality venues, gymnasiums, gym, and museum. In contrast, these needs are compensated and facilitated within cycling distance, which means that the needs within 15 minutes of cycling are theoretically facilitated enough for future generations. This difference is explainable as the population has increased, while the amenities present have remained the same compared to 2024. From these results, it is possible to draw several conclusions.

4.3.4. Partial conclusion

This section was dedicated to answering sub-question 3: "What are the demographic amenity needs of Woensel West according to the 15-minute city, concerning design standards now and in 2040?" From the results, it can be concluded that based on the demographic design standards, all amenities are well provided based on the national average per number of inhabitants situated on the inhabitants of Woensel West for 2024 and 2040 within cycling distance, except sports accommodations. Sportsaccommodations, are less represented for Woensel West's population and scores below the national average.

Looking at the results, some amenities that are present, score below the national average within walking distance in the current time, namely: the supermarkets, drugstore, other daily retail, the dentist, consultation office, gymnasiums, gyms, and outdoor sports accommodations. However, according tot the future situation, pharmacies, physiotherapists, mental healthcare, youth centres, hospitality, and museums are also below the national average, which means that these amenities could be under pressure, as the population grows and the amenity capacity stays the same. These results could indicate that the need for these amenities is lower than average at this location, or more so, but certainly are less represented according to the national average. Also, this could indicate that a part of the inhabitants has limited options within walking distance concerning these amenities. If walking and cycling are distinguished within the 15-minute concept, opinions may differ between the two dimensions, also as we speak about the calculated averages. However, according to the literature every amenity has to be within cycling distance, and which is the case as the range of amenities is increased and the amounts are above the national average within cycling distance, according to the design standards. As shown by the results of this paragraph, adding demographic data and design standards provides a deeper layer, making it possible to add a certain insight in terms of scale to the allocation amount and place of amenities. Therefore, these results can indicate the extent to which amenities are present relative to the population and indicate which amenities are less and more represented relative to the national average, in this case.

So, "What are the demographic amenity needs of Woensel West according to the 15-minute city, concerning design standards now and in 2040?"according to the results, it seems that all of these demographic needs are met, according to the design standards within cycling distance, but become more under pressure by the population growth in the future. However, it is still unclear whether the range of amenities present within the 15-minute radius of walking and cycling in Woensel West is sufficient to meet the needs of the population, even though it scores above the standard, and an adequate assessment tool on accessibility is missing. This is because it remains still unclear whether the amenities are accessible, and whether the inhabitants are satisfied with the presence of the offer within walking and cycling distance, as discussed by the critics' section. Besides, this is even more pressing because other neighbourhoods also use these amenities and may influence the capacity of certain amenities, and harm the accessibility of these amenities for other inhabitants. Besides, if these amenities are already not accessible within walking distance in 2024, this problem will only worsen with future population growth if amenities do not grow with it. Therefore, the next chapter will measure the accessibility, satisfaction, and needs of inhabitants regarding the available amenities. Finding the right balance and placing accessible amenities in appropriate locations can enhance the sustainability effects of the 15-minute city. This approach ensures a fairer allocation of amenities based on local residents, their demographics, and needs, allowing everyone to benefit from the 15-minute city and its amenities.

4.4. The actual 15-minute city amenities satisfaction, accessibility and Needs of Woensel West.

This paragraph is about to what extent the actual needs of the inhabitants are met, even while there is a lot of participation between the neighbourhood organisations of the neighbourhood, and despite the above, or below average supply of amenities. First, the results of the survey will be discussed, concerning demographics, satisfaction, and accessibility per amenity, within walkking and cycling distance. Also, the respondents were asked which amenity they would like to have within walking and cycling distance. Later on, the expert interviews with the management of the neighbourhood organisation are discussed as being the local experts of this research. These interviews are important to indicate to what extent the aspects are met within 15 minutes walking and cycling distance and look for similarities, the way they participate, what is the role of demographics in allocating amenities, as it has happened in recent times and in the present. Finally, new insights will be addressed to substantiate the findings of the survey.

Within the survey, accessibility refers to whether residents can use the amenities present. This is because some amenities are limited in accessibility, for example, a doctor or dentist who can take on a maximum number of patients. This membership cap automatically excludes people and requires them to look for another amenity that might be located outside a 15-minute walk or bike ride, suggesting that the neighbourhood does not fully meet the 15-minute city for all inhabitants. In addition, as the literature and critics pointed out, measuring accessibility, and needs reveals whether there are enough amenities facilitated in Woensel West, and for who they are accessible.

4.4.1. Survey Results from the Inhabitants of Woensel West

This section discusses the results of the survey to assess to what extent the needs are met of the inhabitants of Woensel West according to the 15-minute city. As mentioned earlier, the survey is distributed through multiple methods to increase outreach and participation. This was needed as the population consists of 5.170 inhabitants and the survey must be representative. Therefore, strategic places, among others, are important to create visibility and increase participation. These are places where relatively many people pass by. These include the supermarket, the healthcare centre at the Boschdijk, local retail shops, hospitality spots, apartment complexes, the train station Strijp-S, and bus stops. In addition, also by the already mentioned methods are described in the method section, so by spreading the survey amongst Facebook groups, the volunteers and the network of professionals in the neighbourhood to spread the survey amongst the inhabitants.

Introduction of the survey

Eventually, 114 respondents participated in the survey over a four-week response period. Within these results, Scriptum (2023), SurveyMonkey (2024), and Comsteekp-Cergan (2023) claim that 114 respondents from a survey population of 5.170 are externally valid with a 90% confidence level and a 10% error rate. This means that I can state with 90% certainty that this survey provides insight into the entire population of Woensel West. The results are described in more detail by item in Appendix 9. This section contains only the main findings of the survey and the needs of residents.

As indicated in the survey guide, the survey consists of two parts. The first part (questions one through four) of the survey asked for personal information and the second part asked about their satisfaction with the presence of supply within walking and cycling distance. This is important to know whether the population is satisfied, with the offer present, related to the personal information to create demographic segments. They are then asked about the satisfaction and accessibility of the amenities within 15 minutes of walking and cycling distance. This is important to know whether some demographic segments are more, or less represented by the amenity offer. These results in combination with the satisfaction may indicate whether the inaccessibility has a certain order of priority over other amenity categories. So, for example: there is a high satisfaction over certain amenities, for a large group

where the amenity is applicable, even when there is a low accessibility rate. This means that the priority may generally not be very high, in comparison to a relatively large group that is dissatisfied and has generally a low accessibility. This indicates a higher priority, especially as these amenities are also desired within walking or cycling distance.

Additionally, the survey asks what amenities they would like to have within 15 minutes of walking and cycling distance. This is important to the previous results, as they answer what they may be 'missing' or wanted within the area, and back up their previous answers. Finally, question 11 asks if there are any comments on this survey or topic, to gain additional insights on the survey itself, or aspects that the survey did not cover.

Finally, for the questions dealing with satisfaction, respondents had the opportunity to choose between: 'not at all satisfied', 'not satisfied', 'satisfied', 'not at all satisfied' and 'not applicable/don't know'. However, for the data analysis of these questions, I chose to contrast the results as 'satisfied' versus 'dissatisfied' for each amenity, to make the results more comprehensible. This resulted in the responses 'completely satisfied' being generalised with 'satisfied' and 'completely dissatisfied' being generalised with 'dissatisfied'. Furthermore, the results of the survey are generalised except for those that deal with accessibility. Since this study aims to measure accessibility by target demographic group, the results of these questions are analysed and compared more comprehensively by target group and statistically tested with Chi-Squared tests to look for significant relations and differences between the the demographic segments, in other words, target groups and their accessibility.

Target groups

As a result, the first section made it possible to create the following target groups, based on: how long respondents have lived in the neighbourhood, how large these groups are, as well as who lives in private-sector housing in Woensel West and who lives in social rented housing. The question about how long they lived in the neighbourhood was asked to make relationships between how long residents have lived in Woensel West and their satisfaction and accessibility over the amenities. The results of this question made it possible to make the following target groups as indicated in Table 10.

Table 10 Distribution of target groups

Target groups	Size of target groups (n)	Percentage
1 - 2 years	58	51%
3 - 5 years	23	20%
6- 15 years	22	19%
15 years and over	11	10%
Total	**114**	**100%**

Their postcode was also asked, to determine if the respondents live in a social house or free-sector housing. The answer in combination with internal data sources of the municipality made it possible to see whether the respondents lived in social housing or not. Image 10 shows the distribution of respondents throughout Woensel West. Image 11 shows the distribution of private-sector housing, indicated with red circles. These images in combination with the postal codes, made it easier to presume that the respondents live in a social rented house or a private sector house and made the following distribution, as shown in Table 11.

Table 11 Distribution of target groups

Target groups	Size of target groups (n)	Percentage
Living in social housing	73	64%
Living in free sector housing	41	36%
Total	**114**	**100%**

Inhabitants of the private sector housing are perceived as the gentrifying target group due to their relatively higher estimated income. The respondents who are gentrifyers mainly live in the north of Woensel West.

Moreover, Images 12 to 15 show the distribution of respondents by length of stay in the area across the area. As for the data analysis, having children may affect satisfaction, accessibility and needs for a specific facility offered in an area, such as a primary school or childcare location, in which these amenities may be applicable for them, when asked. Therefore, the survey asked whether respondents have children living at home. The results show that 29% of the respondents have children living at home.

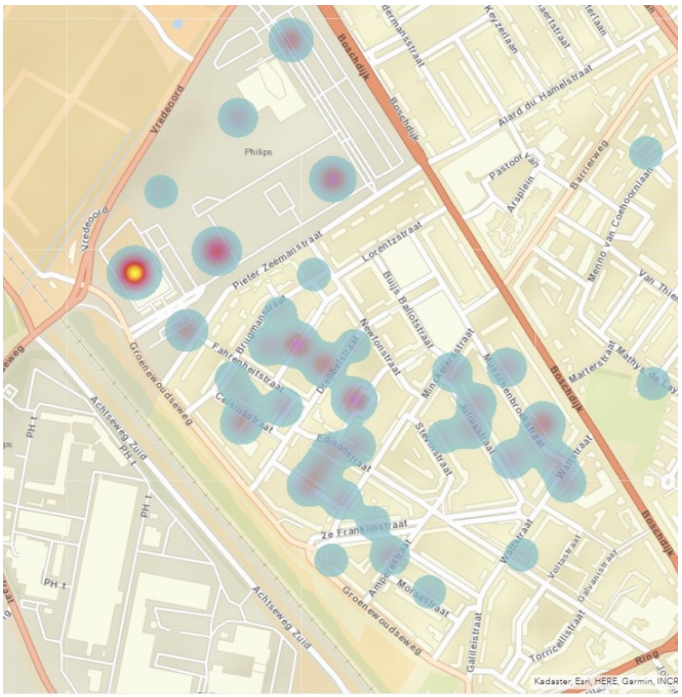
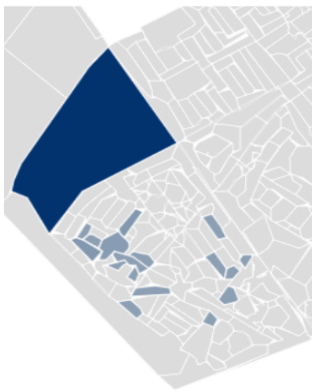


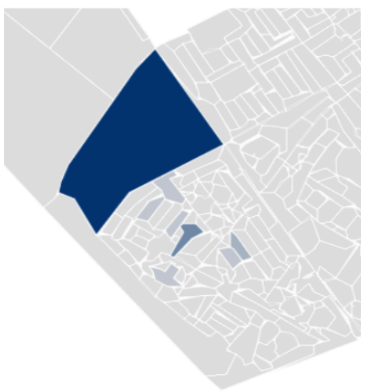
Image 14 Overview of respondents living in Woensel West (Geoweb, 2024; ArcGIS, 2024)

Image 15 the postal codes map, marked with private sector housing in the circles and social rented housing in the coloured areas



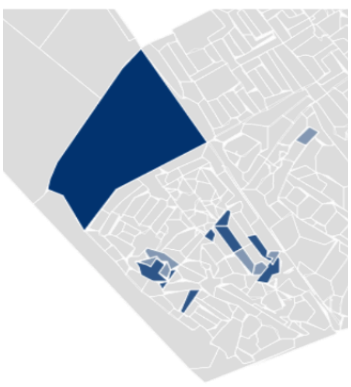
1-2 jaar

Image 10 Map of target group 1-2 years living in the area



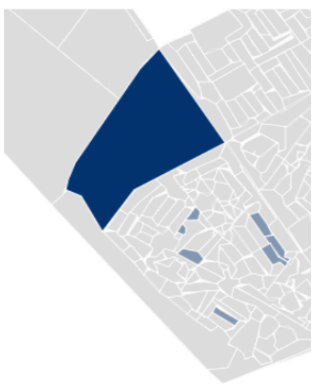
3 - 5 jaar

Image 13 Map of target group 3-5 years living in the area



6-15 jaar

Image 12 Map of target group 6-15 years living in the area



langer dan 15 jaar

Image 11 Map of target group living 15 years or longer in the area

Satisfactory with amenities within walking and cycling distance

First, was asked for the satisfaction with the presence of amenities within 15 minutes of walking and cycling distance through statements. Table 12 shows the results of satisfaction with attendance by amenity type. The first column shows the types of amenities by satisfaction. The second column shows the dissatisfaction with each amenity type, and the third column follows, without counting the 'not applicable/ don't know' responses, to show the satisfaction among the population where this amenity type does apply, and not get a distorted picture.

Table 12 Comparison of Satisfaction between walking and cycling Distance

Satisfactory total (walking/ cycling)	**dissatisfactory total (walking/ cycling)**	**General satisfaction excluding the answers "not applicable/ don't know" (walking/ cycling)**
Green spaces (92%/ 94%)	Supermarket (66%/ 28%)	Green spaces (92%/ 94%)
Opportunity for social meeting/ hospitality venues (74%/ 85%)	The general amenity offers (23%/ 23%)	Primary schools (86%/ 93%)
Specialty shops (60%/ 83%)	Specialty shops (37%/ 16%)	The general amenity offers (77%/ 92%)
Healthcare amenities (66%/ 78%)	Sports amenities (36%/ 16%)	Childcare sites (84%/ 90%)
The general amenities offered (74%/ 74%)	Bus stops (38,6%/ 14%)	Opportunity for social meeting/ hospitality venues (80%/ 90%)
Sports amenities (55%/ 74%)	Healthcare amenities (18%/ 13%)	Healthcare amenities (79%/ 85%)
Supermarket (33%/ 70%)	Playgrounds (32%/ 12%)	Specialty shops (62%/ 84%)
Bus stops (48%/ 69%)	Secondary schools (14%/ 9%)	Sports amenities (65%/ 82%)
Playgrounds (51%/ 57%)	Opportunity for social meetings/ hospitality venues (19%/ 9%)	Playgrounds (62%/ 82%)
Primary schools (44%/ 45%)	Green spaces (8%/ 5%)	Bus stops (56%/ 83%)
Childcare sites (36%/ 41%)	Childcare sites (7%/ 4%)	Secondary schools (59%/ 78%)
Secondary schools (20%/ 31%)	Primary schools (7%/ 4%)	Supermarkets (33%/ 71%)

Within 15 minutes of walking distance

According to the results, Table 12 shows relatively high satisfaction levels for green spaces, the general allocation of amenities, amenities for opportunities for social meetings, such as hospitality venues, and the allocation of childcare. Thereby, column 2 shows a relatively very low satisfaction with the presence of a supermarket concerning the rest of the amenities within 15 minutes of walking distance. These are secondary schools, bus stops, playgrounds, speciality shops and sports amenities. This is reinforced in column three, where satisfaction and dissatisfaction have been calculated for the groups where these amenities apply. Green spaces, for example, parks come first with the highest satisfaction followed by primary schools. A particular insight is that primary school scores are relatively low in column one, as a high proportion of the population filled in 'not applicable/don't know', but for those who did not fill this in, high satisfaction prevails presence of this within walking distance. Again, according to column three, there is relatively high satisfaction with 'opportunities for social meetings' (hospitality venues) (80%). In addition, the relatively low satisfaction with sports amenities (65%), speciality shops (62%), playgrounds (62%), secondary schools (59%), bus stops (56%) and the supermarket (33%).

Within 15 minutes of cycling distance

Overall, there is high satisfaction with most amenities within cycling distance as well, and low dissatisfaction on average for cycling distance. Looking at column three we see that the highest satisfaction is about green spaces (94%), primary schools (93%), the general amenities offered (92%), childcare sites (90%), opportunities for social meetings (90%), healthcare amenities (85%), speciality shops (84%), bus stops (83%), playgrounds (82%), and sports amenities (82%). As we look at all columns the relative highest dissatisfaction is about the supermarkets (71%), and secondary schools (78%).

Comparison of satisfactory walking/ cycling

However, as we compare the results from satisfactory within walking and cycling distance, there are big differences. Looking at column 1, the biggest differences are visible as we look at speciality shops, sports amenities, secondary schools, opportunities for social meetings, bus stops and the healthcare offer. In column two, we see that the dissatisfaction halves within cycling distance. As column three is the most important, we see that the overall satisfaction increases within cycling distance, especially for supermarkets, the general amenities offered, secondary schools, bus stops, the healthcare offer, and the amenities for social meetings. The satisfaction of the amenities that slightly increase, specifically green spaces, primary schools, and childcare sites, indicate that these amenities within cycling distance bring respondents not so much more satisfaction, compared to the amenities within walking distance. From this point of view, a certain priority is given to the amenities where there are large differences in satisfaction within walking and cycling distance, indicating that the amenities within walking distance are relatively less attuned to all the needs of all respondents in general. However, it should be noted that the increase of satisfaction may be a result of the variety of amenities increasing within cycling distance, as the distance increases significantly. The reasons for these results can be varied, and the accessibility of some amenities could be one of them.

The Accessibility of the Amenities Within Walking and Cycling Distance

Therefore, two questions were asked about the ability to use the amenities and thus be accessible. This was asked to have insight into whether some amenities can be inaccessible for some, and have a relation on the satisfaction on the one hand, but also on the amenities wanted within the area. For these two questions, respondents could choose between: ''Yes'', ''No'' and ''Not applicable/don't know''. The results of walking and cycling are shown in the Table 13:

Table 13 Comparison of accessibility between walking/ cycling distance

Type of amenity	Accessible walking/cycling	Not applicable walking/ cycling	Accessibility results without results of 'not applicable/ don't know'
Sports amenities	47% / 74%	31% / 8%	68% / 88%
Amenities for social meeting	82% / 88%	11% / 14%	82% / 95%
Healthcare amenities	63% / 73%	18% / 14%	77% / 85%
Childcare sites	25% / 31%	64% / 61%	67% / 80%
Primary schools	31% / 36%	65% / 61%	87% / 93%
Secondary schools	15% / 26%	75% / 69%	59% / 86%

Table 13 *shows* the overall accessibility across all respondents by column, and by amenity category for walking/cycling. The first column shows the accessibility for the respective amenity category, the second column shows the results of the size of the respondents who filled in 'not applicable/ don't know', instead of that they

could use the amenity or couldn't. Therefore, the third column shows the accessibility results, excluding the answers 'not applicable/ don't know', to prevent a distorted picture of the accessibility. The results show that for some amenities in column 2, a relatively high proportion of respondents indicated that these amenities are not accessible and it is not possible to use these amenities. Especially as we look at sports amenities within walking distance, and the decrease of the percentage of 'not applicable' within cycling distance. This could mean that within walking distance, there is not enough variety of sports amenities facilitated to provide all needs, or that there is a membership freeze, for example.

Looking at column three of the table, we can see that the following amenities, which are present within walking distance, have low accessibility within walking distance: secondary schools, where 59% say they can use this amenity, compared to 41% who cannot (together 100%). The same goes for childcare locations, where 67% of respondents say they can use this, compared to 33% who do not. The same goes for healthcare amenities with 77% accessibility and sports amenities, where 68% can use them within walking distance. However, there is a big increase when looking at the accessibility of these amenities within cycling distance. That is a proportion of Woensel West residents at walking distance experience lower levels of accessible amenities compared to those at cycling distance. These residents who do not have access at walking distance are forced to use amenities within cycling distance. Nevertheless, there is also a proportion within cycling distance that experiences inaccessibility of amenities, especially childcare sites (80%), healthcare amenities (85%) and sports amenities (88%).

Regarding the accessibility of 85% of healthcare amenities within cycling distance, means that a certain number of people, at least 15% in this case cannot use healthcare amenities within walking and cycling distance, and must travel further than 15 minutes cycling to receive healthcare. This is also the case for childcare sites, and sports amenities. Primary schools, however, show that accessibility is relatively high and does not increase much within walking and cycling distance. This can mean that much variation in walking and cycling distance is present, but most Woensel West residents have access to primary schools within walking distance. This conclusion can also be made for the other amenities, as accessibility is less than 100% for all of them. Thus, it means that some respondents who filled in 'not applicable' do not use the amenities or can use them within 15 minutes of cycling distance.

Finally, if we look at the accessibility of primary schools and amenities for social meetings, it generally scores relatively high in columns one and three, with accessibility also being relatively high. Nevertheless, overall, the amenities score relatively high when it comes to overall accessibility. However, when looking by target group, there are several differences by amenity.

Comparison between walking and cycling distance by target group

Table 14 to Table 37 show the results presented in tables per target group types: one target group category consists of different periods of people living in Woensel West. A distinction is also made between residents of social-rented housing and residents of private-sector housing.

From these target groups, it is examined whether the length of time residents live in Woensel West have significant differences from each other when it comes to accessibility of the amenities. The same was done for residents of private-sector housing and residents of social housing. As the target group sizes are of different sizes and therefore create different averages, statistical analysis was performed across all these tables to see if there are statistically significant relationships between the target groups and the accessibility of the respective amenities. This is done through the Chi-Squared test, in which the answers "not applicable" were not included, to prevent a distorted picture in the results. The target groups that are marked with a '*', show significant differences. Based on the results of the chi-squared calculations, it is possible to reject or not reject hypotheses H0, and H0a of this study. Below, the target groups that are statistically significantly different from each other concerning accessibility are explained.

Accessibility results by amenity category and by target group

Results of sports amenities per target group

Table 14 Accessibility of sports amenities walking distance

Results sports amenities within 15 minutes of walking distance

Target group	Size of target group (n)	Accessible	inaccessible	Not applicable/ don't know	Total
1-2 years	58	48%	19%	33%	100%
3-5 years	23	48%	17%	35%	100%
6-15 years	22	50%	32%	18%	100%
15 years and longer	11	36%	18%	46%	100%
Total	114				100%

Table 15 Accessibility of sports amenities cycling distance

Results sports amenities within 15 minute cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	76%	9%	15%	100%
3-5 years	23	70%	13%	17%	100%
6-15 years	22	73%	9%	18%	100%
15 years and longer	11	73%	9%	18%	100%
Total	114				100%

Table 16 Accessibility of sports amenities between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	46%	24%	30%	100%
Social housing	73	47%	16%	37%	100%
Total	114				100%

Table 17 Accessibility of sports amenities between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	71%	12%	17%	100%
Social housing	73	74%	7%	19%	100%
Total	114				100%

The results show no significant differences between the target groups and their accessibility to sports amenities.

Results for amenities for social meetings (hospitality) per target group

Table 18 Accessibility of the amenities for social meetings (hospitality) within walking distance

Within 15-minutes of walking distance per target group

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	86%	5%	9%	100%
3-5 years	23	91%	4%	5%	100%
6-15 years	22	86%	5%	9%	100%
15 years and longer	11	100%	0%	0%	100%
Total	114				100%

Table 19 Accessibility of the amenities for social meetings (hospitality) within cycling distance

Within 15-minutes of cycling distance per target group

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	total
1-2 years	58	84%	7%	9%	100%
3-5 years	23	91%	4%	5%	100%
6-15 years	22	86%	0%	14%	100%
15 years and longer	11	100%	0%	0%	100%
Total	114				100%

Table 20 Accessibility of the amenities for social meetings (hospitality) between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	71%	10%	19%	100%
Social housing	73	88%	6%	6%	100%
Total	114				100%

Table 21 Accessibility of the amenities for social meetings (hospitality) between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	88%	0%	12%	100%
Social housing	73	90%	7%	3%	100%
Total	114				100%

The results show no significant differences between the target groups and their accessibility to amenities for social meetings.

Results of healthcare amenities per target group

Table 22 Accessibility of the healthcare amenities within walking distance

Within 15-minutes of walking distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	52%	22%	26%	100%
3-5 years	23	74%	17%	9%	100%
6-15 years	22	82%	9%	9%	100%
15 years and longer	11	73%	9%	18%	100%
Total	114				100%

Table 23 Accessibility of the healthcare amenities within cycling distance

Within 15-minutes of Cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	64%	16%	20%	100%
3-5 years	23	74%	13%	13%	100%
6-15 years	22	82%	14%	4%	100%
15 years and longer	11	100%	0%	0%	100%
Total	114				100%

Table 24 Accessibility of the healthcare amenities between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	61%	17%	22%	100%
Social housing	73	60%	15%	25%	100%
Total	114				100%

Table 25 Accessibility of the healthcare amenities between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing*	41	71%	15%	14%	100%
Social housing*	73	77%	12%	11%	100%
Total	114				100%

The results show significant differences between the target groups who live in social housing and the people who live in private housing and their accessibility to healthcare amenities within cycling distance, in which the people who live in social housing have more accessbility than the people who live in private sector housing. However, the other results show no significant differences between the target groups and their accessibility to healthcare amenities.

Results of childcare locations by target group

Table 26 Accessibility of childcare locations within walking distance

Within 15-minutes of walking distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	22%	7%	71%	100%
3-5 years	23	13%	22%	65%	100%
6-15 years	22	36%	18%	46%	100%
15 years and longer	11	27%	0%	73%	100%
Total	114				100%

Table 27 Accessibility of childcare locations within cycling distance between target groups categorised by duration they live in Woensel west

Within 15-minutes of cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	26%	5%	69%	100%
3-5 years	23	26%	17%	57%	100%
6-15 years	22	41%	5%	54%	100%
15 years and longer	11	36%	0%	74%	100%
Total	114				100%

Table 28 Accessibility of childcare locations between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing*	41	20%	22%	58%	100%
Social housing*	73	25%	7%	68%	100%
Total	114				100%

Table 29 Accessibility of childcare locations between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	27%	12%	61%	100%
Social housing	73	33%	5%	62%	100%
Total	114				100%

The results show significant differences between the target groups who live in social housing and the people who live in private housing and their accessibility to childcare locations within walking distance, in which the people who live in social housing have more accessbility than the people who live in private sector housing. The other results however, show no significant differences between the target groups and their accessibility to childcare locations.

Results of primary schools by target group

Table 30 Accessibility of primary schools within walking distance

Within 15-minutes of walking distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	28%	5%	67%	100%
3-5 years	23	22%	0%	78%	100%
6-15 years	22	45%	10%	45%	100%
15 years and longer	11	36%	0%	64%	100%
Total	114				100%

Table 31 Accessibility of primary schools within cycling distance

Within 15-minutes of cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	32%	3%	65%	100%
3-5 years	23	35%	4%	61%	100%
6-15 years	22	50%	0%	50%	100%
15 years and longer	11	36%	0%	64%	100%
Total	114				100%

Table 32 Accessibility of primary schools between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing*	41	17%	10%	73%	100%
Social housing*	73	37%	0%	63%	100%
Total	114				100%

Table 33 Accessibility of primary schools between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	32%	5%	63%	100%
Social housing	73	36%	1%	63%	100%
Total	114				100%

The results show significant differences between the target groups who live in social housing and the people who live in private housing and their accessibility to primary schools within walking distance, in which the people who live in social housing have more accessbility than the people who live in private sector housing. The other results however, show no significant differences between the target groups and their accessibility to primary schools.

Results of secondary schools by target group

Table 34 Accessibility of secondary schools within walking distance

Within 15-minutes of walking distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	19%	5%	76%	100%
3-5 years	23	13%	13%	64%	100%
6-15 years	22	14%	18%	68%	100%
15 years and longer	11	36%	18%	46%	100%
Total	114				100%

Table 35 Accessibility of secondary schools within cycling distance

Within 15-minutes of cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
1-2 years	58	30%	6%	64%	100%
3-5 years	23	30%	9%	61%	100%
6-15 years	22	77%	0%	23%	100%
15 years and longer	11	27%	0%	73%	100%
Total	114				100%

Table 36 Accessibility of secondary schools between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing*	41	15%	15%	70%	100%
Social housing*	73	19%	8%	73%	100%
Total	114				100%

Table 37 Accessibility of secondary schools between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	Size of target group (n)	Accessible	Inaccessible	Not applicable/ don't know	Total
Private sector housing	41	17%	5%	77%	100%
Social housing	73	30%	4%	66%	100%
Total	114				100%

The results show significant differences between the target groups who live in social housing and the people who live in private housing and their accessibility to seconary schools within walking distance, in which the people who live in social housing have more accessbility than the people who live in private sector housing. The other results however, show no significant differences between the target groups and their accessibility to secondary schools.

Accessibility by target group by housing type

The Chi-square test showed that there are no statistically significant differences when looking at the type of housing where someone lives in Woensel West and the accessibility of the following amenity categories: sports, amenities for social meetings, healthcare amenities and secondary schools within walking distance. These results are supported by all tests performed; (Pearson's chi-square, continuity correction, likelihood ratio and Fisher's exact test). These tests support these conclusions because p-values are well above the usual significance level of p = 0.05 and H0a: “There is no difference in amenity accessibility between residents of social rented housing, compared to residents of private sector housing”, cannot be rejected based on these results. This is also true for sports amenities, amenities for social meetings, childcare locations, primary schools and secondary schools within cycling distance. However, it should be noted that these tests did not comply with the Chi-Squared assumptions, therefore, conclusions cannot 100% be confirmed, as there is insufficient evidence to confidently state the conclusion regarding rejecting H0a. In contrast, the expected frequencies HAVE met the assumptions of the Chi-Square tests concerning sports amenities, and healthcare amenities, within walking distance and can be called trustworthy. However, neither did any of the amenities within cycling distance. For these amenities related to residents of certain housing types, H0 cannot be rejected based on the significance values above p = .05, while meeting the assumptions.

Conversely, there is a significant difference and sufficient evidence to reject H0a when looking at childcare locations within walking distance, where residents of a certain housing type and accessibility differ significantly. Indeed, the results show that residents of social rented housing have more accessibility to childcare locations than residents of private sector housing within walking distance. This is supported by the test performed (Pierson Chi-squared), which allows H0a to be rejected for this amenity. Finally, there are no amenities within cycling distance that show significant differences and have sufficient evidence to confirm this. However, this does not apply to amenities for social meetings, primary schools and secondary schools, within walking distance when looking at the assumptions of the tests about these amenities. Tests show that the results do not meet the Chi-square assumptions. The same is true for sports amenities, social meetings, childcare locations, primary schools and secondary schools within cycling distance.

Moreover, primary schools within walking distance showed significantly large differences between residents of private sector housing and those of social rented housing, with the p-value scoring below the maximum value of p = .05. Based on this, H0a should be rejected for the accessibility comparison between residents of social rented and private sector housing for these amenities. For the practical situation, this means that residents of social housing have more accessibility to primary schools than residents of private sector housing. The same is also true for healthcare amenities within cycling distance, with residents of social housing having more access to healthcare amenities. However, these tests did not meet the expected frequencies and hence the assumptions of the Chi-squared test, with some of the results for more than the 20% expected frequency number.

Accessibility by target group by length of time people live in Woensel West

The Chi-square tests revealed that there are no statistically significant differences when looking at the duration of how long someone lives in Woensel West and the accessibility to sports amenities, social meeting amenities, healthcare, childcare locations, primary schools and secondary schools within walking distance. This is supported by the results, with the results scoring well above the p-value. However, since the assumptions of the Chi-square test are violated, in that for these amenities more than 20% of the cells fall below the minimum expected frequency value of 5, this leads to less reliable results. As a result, also there is insufficient evidence to reject H0. This also applies to sports amenities, social meeting amenities, healthcare, primary schools and secondary schools within cycling distance. The statistical results are further specified in Appendix 9.

Amenity needs

The survey asked respondents, 'What amenity would you like to have within a 15-minute walk or cycling?' Here the options for each amenity type were: 'walking', 'cycling' and 'not applicable' This question was asked to see where the needs of Woensel West residents are and give a clear overview of amenities preferred within walking or cycling distance, and look for priority, in combination with the accessibility and satisfaction result. These results could help policymakers in allocating the amenities. As we look at the table, the percentages represent the amount of people who voted for the amenity to be within walking distance or cycling distance. For example: 90% of the people voted for supermarkets within cycling distance, and 4% of the total respondents said that this amenity does not apply to them. Conversely, we see that 96% of the total respondents find that the supermarket applies to them. This table is ordered by the need for certain amenities within walking distance. From this question, the following results are shown in Table 38.

Table 38 Outcome Survey Question "What amenity would you like to have within a 15-minute walk or cycle?"

Amenity type	Walking	Cycling	Not applicable/ don't know	Total
Supermarket	90%	5%	5%	100%
Restaurants and cafés	75%	18%	7%	100%
Drugstore	67%	25%	8%	100%
Community centre	55%	11%	34%	100%
Pharmacy	54%	35%	11%	100%
Doctor	50%	39%	11%	100%
Gym	49%	36%	15%	100%
Playgrounds	49%	11%	40%	100%
Sportsfield	46%	24%	30%	100%
Other retail shops	40%	47%	13%	100%
Primary schools	39%	12%	49%	100%
Dentists	27%	59%	14%	100%
Consultation office	24%	25%	51%	100%
Exhibition hall	21%	48%	31%	100%
Psychologist	15%	53%	32%	100%
Obestric	11%	33%	56%	100%
Museum	11%	63%	26%	100%
Gymnasium	16%	45%	39%	100%
Secondary school	10%	40%	50%	100%

At first sight, the results show a strong need for a supermarket, restaurants and cafes, a drugstore, a community centre, a pharmacy, a gym, playgrounds, a sports field and other retail within walking distance. As mentioned, A low result 'not applicable' means that this amenity applies to a relatively larger group.

Next to the supermarket that is wanted, cafés, the drugstore, a community centre and the doctor are also wanted by the majority. If we make an overview of amenities within walking and cycling distance by priority according to the survey, Table 39 shows the ranking per amenity for walking and Table 40 for cycling.

Table 39 Most wanted amenities within walking distance

Amenities ranked by priority within walking distance	Needs per amenity	(Size) Applicable target group	needs * applicable = Most wanted
Supermarket	90%	96%	86%
Restaurants and cafés	75%	94%	71%
Drugstore	67%	92%	62%
Pharmacy	54%	89%	48%
Doctor	50%	89%	45%
Gym	49%	85%	42%
Community centre	55%	66%	36%
Other retail shops	40%	88%	35%
Sports field	46%	69%	32%
Playgrounds	49%	60%	29%
Dentists	27%	86%	23%
Primary schools	39%	51%	20%
Exhibition hall	21%	69%	14%
Consultation office	24%	48%	12%
Psychologist	15%	67%	10%
Gymnasium	16%	60%	10%
Museum	11%	74%	8%
Secondary school	10%	49%	5%
Obestric	11%	43%	5%

Table 40 Most wanted amenities within cycling distance

Amenities by priority within cycling distance	Needs per amenity	(Size) Applicable target group	needs * applicable = Most wanted
Dentists	59%	86%	51%
Museum	63%	74%	47%
Other retail shops	47%	88%	41%
Psychologist	53%	67%	36%
Doctor	39%	89%	35%
Exhibition hall	48%	69%	33%
Pharmacy	35%	89%	31%
Gym	36%	85%	31%
Gymnasium	45%	60%	27%
Drugstore	25%	92%	23%
Secondary school	40%	49%	20%
Restaurants and cafés	18%	94%	17%
Sportsfield	24%	69%	17%
Obestric	33%	43%	14%
Consultation office	25%	48%	12%
Community centre	11%	66%	7%

Playgrounds	11%	60%	7%
Primary schools	12%	51%	6%
Supermarket	5%	96%	5%

The results displayed in Table 39 show a clear need for supermarkets, restaurants and cafes, a drugstore, a Pharmacy, a community centre and a doctor amongst others, within walking distance. Within cycling distance, there is a relatively high need for a dentist, museums, other retail shops, a psychologist and an exhibition space. In addition, the results displayed in Table 40 also show that amenities within cycling distance have a higher priority within cycling distance, compared to walking distance. This is also true for certain amenities that are more desired within walking distance compared to cycling distance, like the supermarket. Restaurants and cafés and healthcare amenities like the doctor, and pharmacy. As Policymaker 2 mentions some amenities are 'nice to have' and some are 'needed', these results confirm that a dentist is something that must be provided, compared to a café, where there is already a high variety present, a high satisfactory and accessibility. A distinction could therefore be made based on what is needed based on priority: the size of the target group, in combination with accessibility and satisfaction. Now that the results have been discussed from the survey, and indicated their importance within this research, the next paragraph will elaborate on the results from the interviews that complement the answer to the sub-question and in some cases apply triangulation to the results just discussed.

4.4.2. Interviews with the management of the neighbourhood organisation

As mentioned in the operationalisation and methodology section, I interviewed the management of the neighbourhood organisation to find out residents' needs, as an additional method to the survey. They have been active since the neighbourhood organisation's start, so they have a lot of local experience in the neighbourhood and thus knowledge concerning the local needs. Therefore, these experts can give additional insights about the needs in the neighbourhood to some extent, next to the survey, when it comes to the presence of amenities within 15-minute walking and cycling distance.

Results of the interviews

As described in the operationalisation and the neighbourhood description, paragraph 4.1, cooperation has been important and needs are constantly monitored by the population in the general sense, but also explicitly at the individual level. This participation covers all kinds of topics, so also about the allocation of amenities. This also indicated that in the past, not many businesses wanted to settle in the area, so a lot of action had to be taken by the cooperating parties to improve the business climate. Bringing back a solid base would create a good settlement climate for businesses, make the neighbourhood attractive to other people, organisations/amenities to change the image and enhance liveability, and reduce the problems faced by the neighbourhood and its residents.

> *"At the beginning, if the basics are not in order, you can allocate what you want (amenities), but then it is unsuccessful in the long run."* (Interview 4)

In the end, the investments made by the partnership, which are explained in section 4.1., are having success, which means that now many companies want to establish in Woensel West, and are supervised, considering the local population, as local experts say in the following quotes:

> *"So, I know that Trudo they did start that pretty quickly to get businesses, small-scale entrepreneurs, small businesses in there in Edisonstraat in the plinth. I also knew at the very beginning that that was quite a job, to get people (businesses) for that. And now there is a waiting list."* (Interview 4).

This eventually resulted in various amenities according to different demographic segments, especially for people with less to spend.

> *"We have a cheap bakery, a cheap bicycle shop, a second-hand shop, and there will be another supermarket. There (in Woensel West), are cafeterias with four-euro coffee on the one hand, which the normal man cannot afford, but on the other hand, we also have three places at least where you can have free coffee. In addition to that, we (Woensel West) also have yesterday's bread "* (Interview 3)

The other expert from interview 4, confirms the variety of amenities that the programme manager explains. She talks about entrepreneurs, as they are the ones to provide certain services in the area, and are the amenities, such as the dentist, the doctor, the supermarket owner, amongst others.

> *"If you look at the businesses in the neighbourhood it is very defined and varied for several target groups. For example, the bakery, it's a bakery selling yesterday's bread for a small price. Well, that runs very well and in the afternoon they are sold out. Next to that, one of the entrepreneurs has a second-hand shop for children's clothes, so I think the amenity offer is good. Yes, in Woensel West is also definitely really an offer for the top segment (gentrifiers of the neighbourhood, who can spend more resources on goods and services), and are more expensive. But some amenities/ businesses are just a bit more specialised and therefore often a bit higher with the price. I think for what it's worth, I do see that there is a good offer"* (Interview 4)

The programme manager refers to Trudo's process of making real estate available for amenities that contribute to the needs within the area and thus contribute to residents.

> *"So, for all groups, the level of amenities is present and available. It's a very defined offer here in the neighbourhood. And then yes... Sometimes, people try to frame that (amenities) into a certain corner, and if that is not justified, then I make decisions about that."* (Interview 3)

Considering the need for other amenities within the 15-minute city, the neighbourhood offers a varied supply to meet the needs of inhabitants from different demographic segments. As a result, experts believe the needs are well met, although there is always a demand for something, depending on who you ask. The participatory process and interviews with these experts reveal a common need for a supermarket and a drugstore in the neighbourhood.The supermarket already present is not within the 15-minute walk radius for everyone in the neighbourhood, but it is within 15 minutes cycling. On this basis, there will be a supermarket in the neighbourhood, although there is now dissatisfaction about the type of supermarket when it comes to the price segment and the supermarket in question (which is going to be there) is considered too expensive. This dissatisfaction comes mainly from the inhabitants who experience livelihood security challenges, which is probably the largest demographic group in the neighbourhood. Indeed, the neighbourhood would benefit more from a cheaper supermarket. Because the supermarket that is going to be there now is too expensive, this group does not feel heard. The area director adds that a cheaper supermarket, like Aldi or Lidl fits better in the Woensel West neighbourhood and that the current allocation is due to the different interests of market players, which does not quite match the needs of the majority of the inhabitants. This is evidenced by:

> *“If they can choose then, yes, something of drugstore or supermarket indeed, and then more for small groceries that you can get those. But anyway, on Edisonstraat you have a Turkish supermarket with fruit and vegetables. A lot of people also go there to do their shopping, AND you have the bakery. So, there are*

both products nearby. Those are also two examples, of where you can do your shopping cheaply." (Interview 4)

However, the current supply does not fulfil their needs, despite there is a Turkish supermarket.

> *"Yes, I also know that they..., that they have those two points that I mentioned from one, from on the square, so those stickers from the Spar are on the windows on the square, well, of course, there's comments here: "(that's a) way too expensive supermarket", "And why not (Aldi, or Lidle)?" Anyway, it's just a small, tiny space. What I understood is that not all supermarkets were interested in it because it was limited to square metres. But that then comes back from the neighbourhood. Of "Why this choice?" and "That's way too expensive. The image of Woensel West is then surely linked to supermarket Lidl or Aldi and not to a Spar."* (interview 4)

From this perspective, it becomes clear that a difference exists in the interests of residents who are in high demand, but conversely, from an economic perspective, the supermarkets seem to find the location climate insufficient, according to the experts. These differences may explain why it can be difficult to provide amenities in neighbourhoods according to local needs, and difficulties of the Dutch real estate market, due to different interests, as I pointed out in the societal relevance section of this research, and Policymaker 2 confirms (Interview 2).

4.4.3. Partial conclusion

This chapter focused on answering sub-question 4: "To what extent are the amenity needs of Woensel West met relating to the 15-minute city, according to the inhabitants?" To answer this question, I interviewed local experts from the Woensel West neighbourhood organisation and distributed a survey to its residents. The interview and survey focused on the amenities available within a 15-minute walking and cycling distance for Woensel West residents. Through these methods, I addressed the residents' perspectives on the amenities offered, their satisfaction, accessibility, and needs within this radius. This chapter discussed the results whevery the following conclusions can be made, related to sub-question four. First, the interviews revealed that cooperation between parties played a crucial role in improving the neighbourhood, aligning with the 15-minute city framework, and addressing residents' needs by providing amenities based on demographic input gathered through participation.

From participatory processes and research, it emerged that safety, and the business climate or the so-called "basics" according to the programme manager, had to be good first to place amenities after. During this process, demographics were considered of the current and future inhabitants, while placing amenities was controlled to attract certain demographic groups, and volunteers to offer certain activities, all tailored to the demographic needs, that contributed to the enhancement of the overall environment that made it attractive for people and amenities to settle. As a result of these methods, and the collaboration between the municipality, Trudo and the neighbourhood organisation amongst others, the neighbourhood has improved considerably and has a well-controlled offer that matches most local needs. Through constant participation with residents and constantly monitoring where needs lie, actions are taken based on this. According to experts, and the survey results, the needs are indeed well met for all demographic groups, as amenities are present and varied, so are tailored to the needs of the inhabitants and their demographic segment. According to the local experts, there is a waiting list of entrepreneurs, in other words, the amenities, who want to settle in Woensel West due to the pleasant business climate, whereas this was the opposite 20 years ago. However, the experts stress the great desire for a cheap supermarket, such as a Lidl or Aldi within walking distance for the residents of Woensel West.

This was also evident from the results of sub-questions two and three but is now also confirmed by the survey results among Woensel West residents. This is confirmed by the survey results as we look at the general satisfaction

with the accessible supply within walking and cycling distance. From this survey, it should first be noted that the results show that there may be a big difference between opinions on amenities within 15 minutes of cycling and cycling. As we look at the satisfaction with the presence of amenities, the results show that there is high satisfaction with most amenities within walking distance, however some amenity types have a high dissatisfaciton within walking distance, especially: supermarkts (33%), secondary schools (59%), bus stops (56%), speciality shops (62%), sports amenities (65%) and playgrounds (62%). Comparing these satisfactionresults within walking distance with the satisfaction within cycling distance, it shows that satisfaction generally concerning all amenities increases, as there is a higher variety of amenities through the increase of distance. However, despite the significant increase, the satisfaction for the supermarkets (71%), and secondary schools (78%) remains relatively low, compared to the others within cycling distance, in which most score well above 80% and 90%. This indicates an overall relatively lower satisfaction with these amenities within walking distance, in other words, the amenities within Woensel West, compared to the same amenities within cycling distance, but also for these two amenity types within cycling distance.

Concerning accessibility of the amenities, the results show that amenity types generally have relatively high accessibility. But when we look deeper into the results for these amenity types in comparison with each other. The results show that the accessibility of childcare amenities is relatively low (67%), secondary schools (59%), healthcare- (77%), and sports amenities (68%) within walking distance. In general, concerning all inhabitants, the accessibility of all amenities increases structurally and exponentially when considering the amenity supply within cycling distance, especially as we look at amenities for social meetings, for example hospitality venues (95%), primary schools (93%), sports amenities (88%). However, despite the significant increase, there is still relatively a low accessibility of childcare sites (80%), and healthcare amenities (85%) within cycling distance. Still, these results show that for these amenities have the lowest accessibility and a certain number of residents (20%) and (15%) do not have access to these amenities and must travel further to receive these services.

As we look at both the results of satisfaction and accessibility, these results show an interrelationship between satisfaction with the presence and the accessibility of sports amenities, supermarkets, secondary schools, and childcare sites within walking and cycling distance. This relationship is strengthened by the results on where explicitly to which amenity was desired and the results of additional comments from residents. In contrast, this is not the case as we look at amenities for social meetings. There is a high satisfaction of 80% within walking distance, and 90% within cycling distance, and a high accessbility of 82% and 95%, despite of these results, more of these amenities are wanted. As the inhabitants already have a high satisfaction and accessibility, but still want these, would adding more of these make much impact and would it have a higher priority in relation to healthcare amenities, childcare locations, a high school and a supermakt within walking and cycling distance on satisfaction and accessibility?

Regarding the accessibility results of the chi-squared tests and per target group, there are few differences between the target groups living in private sector housing and those in social rented housing, allowing us to reject H0a: “There is no difference in amenity accessibility between residents of social rented housing, compared to residents of private sector housing”. Childcare locations are more often available to people living in social rented housing within walking distance than to those living in private sector housing. In contrast, no significant differences are seen between housing types concerning the accessibility of sports amenities, amenities for social meetings, and primary and secondary schools within walking and cycling distance. This is also true of healthcare amenities within walking distance and childcare locations within cycling distance. Furthermore, significant differences are visible between primary schools within walking distance, and healthcare amenities within cycling distance, where residents of social housing are more likely to have access than residents of free sector housing. However, the results of these two amenities do not meet chi-square assumptions, making the reliability of these conclusions debatable. When looking

at accessibility and length of time people live in Woensel West, no significant differences are generally shown between target groups within walking and cycling distance. However, the test results do not appear to adhere to the assumptions either.

Altogether, to answer sub-question four: “To what extent are the amenity needs of Woensel West met relating to the 15-minute city, according to the inhabitants?” Partly. It can be concluded that there is unfair access to all amenities when compared to all inhabitants, and some target groups, especially the inhabitants of private sector housing to childcare locations and secondary schools within walking distance and healthcare amenities within cycling distance, as they have less access compared to inhabitants of social housing. As a result, Woensel West does not meet the 15-minute city concept for everyone based on this study. Since it is clear which amenities are desirable and inaccessible, this allows targeted allocation of amenities to meet needs by facilitating amenities to increase the accessibility and services to more people within the neighbourhood, and thereby increasing sustainability effects of the 15-minute city for a larger share of residents. As long as these amenities are not facilitated and in particular for these target groups of Woensel West, this will have several consequences for Woensel West and Eindhoven. Firstly, not everyone will have access to these amenities which is already the case at present, secondly, the neighbourhood will continue to meet the 15-minute city within the scope of this study to a limited extent, and thirdly, this situation in terms of amenity accessibility and satisfaction will only worsen and create greater inequality compared to now because of future population growth until 2040. Finally, despite mapping need, accessibility and satisfaction, different interests may pose challenges to having these amenities located in some locations.

5. Conclusion

This research was all about engaging and demonstrating the importance of demographic data and design standards in the 15-minute concept. In doing so, the main question was: “What is the effect of including demographics and design standards in the 15-minute city to allocating amenities in Woensel West?” To this end, mixed-method research was conducted on the 15-minute city, including demographics and design standards within the study area using four sub-questions.

The results showed that 20 years ago Woensel West had been identified as one of the neighbourhoods with the highest liveability problems in the Netherlands. However, through participation processes in which demographics played a huge part in the relocation programme of new inhabitants and controlled allocation of amenities, the neighbourhood has since improved and the number of amenities in the neighbourhood and its surroundings has increased. As a result nowadays, Woensel West meets the 15-minute city concept, based on the existing literature, and operationalised amenities, within a 15-minute cycling distance. This is evidenced by the fact that all amenities are frequent within a cycling radius. However, the results of amenity presence against demographics and design standards showed that nine of the 25 amenities present scored below the national average within 15-minute walking distance, namely the supermarkets, drugstores, speciality shops, pharmacies, dentists, mental healthcare, gymnasiums, gyms and outdoor sports accommodations and are therefore less represented relating to the national average. But as this compensated within a 15-minute cycling distance, it is found that 1 of the 25 amenities present is below the national average (outdoor sports accommodations), and the other amenities are generally frequently present. However, an above-average presence does not mean that these amenities are accessible. Therefore, the survey showed that none of the amenities were equally accessible to the general population, especially for childcare sites, healthcare amenities, secondary schools and sports amenities. As we looked at target groups, this was also the case but even larger differences, in which inhabitants from social housing have often more access to childcare sites, secondary schools and healthcare amenities than people living in private sector housing. For these amenities we could reject H0a. When looking at the duration that people live in Woensel West, there were generally no significant differences from the Pearson Chi-square test, which means that H0 cannot be rejected based on how long people have lived in the neighbourhood and their accessibility to amenities. In addition, it became clear which amenities have a higher priority at walking and cycling distance as it appears that some amenities are sought after within these distance dimensions. Simultaneously, these amenities are additionally needed to meet the 15-minute city to allow everyone to be provided with this service, as there is relatively low accessibility and therefore partial access to the 15-minute city.

Finally, to answer the main question, the results of this study show that including demographic data and design standards in the 15-minute concept can be of great importance for three reasons. First, the use of demographic data and design standards gives more insight into the presence of supply concerning averages to assess the present quantity. Second, by measuring availability by demographics and its segments, this information makes the allocation of amenities in specific places for specific target groups easier, and more insightful, and the placement of amenities can be prioritised according to need and importance, as it becomes clear which target group can and cannot benefit from the presence of amenities, how big this need is and where it can be placed (within walking or cycling distance). Third, if accessibility is transparent, it can become clearer to which target groups the 15-minute city concept does and does not apply. Thus, based on this information, spatial and social inequalities can be understood, and if acted upon the sustainability contributions of the concept can be increased by focusing on the marginalised target groups. While the 15-minute city concept holds significant sustainable potential, leveraging demographics and accessibility outcomes can enhance its impact. These tools ensure cities become more sustainable and reduce inequality. To fully realize this vision, we must critically consider how we implement the 15-minute concept.

6. Discussion

This chapter presents and discusses the results of this research, suggesting improvements and justifying the current outcomes, supported by literature findings. Overall, the results align with my expectations and are generiseable. They highlight the importance of demographics and design standards in allocating amenities, confirming the potential of the 15-minute city when these factors are considered. The survey responses and expert interviews validate the methods used to achieve the desired results. Consequently, there is high overall satisfaction and accessibility to amenities among respondents, except for supermarkets, sports amenities, bus stops, and healthcare amenities which are also needed by the respondents.

Concerning the high or low scores of accessibility and satisfaction with the presence of the amenities offered, there may be several reasons for these outcomes. Some examples are: a membership freeze by, for example, the amenities on which there is a maximum number of members. In addition, an amenity may also not fully meet the needs of a particular target group by being too expensive for some demographic groups. Each amenity and target group may have different reasons why these amenities are not accessible and could therefore be investigated further. In addition, a notable result is that policymaker 2 noted during Interview 2 that at all times there will be a need for more entertainment, such as restaurants and cafes, while there is already high satisfaction, accessibility and attendance. This is also the case from the results of the survey, as there is high accessibility and satisfaction with their presence, but more of these amenities are desired. These amenities will therefore often be preferable to a dentist that can be located nearby. As described by (Interview 2) there are 'must have' amenities and 'nice to have' amenities. The survey shows that some amenities are indeed desired within walking distance compared to cycling distance and could relate to a NIMBY effect, or people don't mind to travel further for these amenties. However, eventually this amenity should be placed somewhere within walking distance, despite the preference of inhabitants.

In addition, the study complements the existing literature on the 15-minute city the sustainable contributions the concept has and its application. This is evident from the reviews by Carlino & Sáiz (2008), Casarin et al. (2023), Reza Khavarian-Garmsir et al. (2023) and Guzman (2024), stating that the 15-minute concept is a one-size-fits-all approach and could increase inequality if demographics and local societal needs are not considered important aspects with the allocation of amenities. By considering demographic changes, these demographic needs can be taken more into account and the marginalisation of target groups can be countered (Laws, 2013). As discussed under scientific relevance, Reza Khavarian-Garmsir et al (2023) indicated that a study should be done on the application of this concept with demographics taken into account and that is what I have done with my study. Going back to the criticisms of Knap (2017) and Guzman (2024), there could be more one-sidedness within the framework of the operationalisation and conceptualisation of the 15-minute city. Especially, since many studies do not use the same metrics, for example, concerning which amenities are perceived as 'amenities for daily needs' and should be included. Likewise, for distance that must be covered within within 15 minutes of walking and cycling. This leads to different studies, results, and findings on the 15-minute city.

Concerning the implications and results from the literature, its seems that they are consistent with my findings. This is because the implications of this research could be that the 15-minute concept, with demographics and design standards considered, can ensure a fairer distribution of amenities in a city based on accessibility. This is because the methodology of this research ensures that the 15-minute concept becomes a bottom-up approach and makes it possible to reduce spatial and social inequality within the accessibility framework but also continue to create longer-term value than an amenity that has low support of its community through a lack of needs. In addition, this is also because some amenities are more specific than others, for example a university, or a school offering only gymnasium and atheneum education, and cannot always be placed within every neighbourhood due to spatial constraints, as well as sufficient demand which is needed for the amenity to be economically continuous. Looking

at Woensel West, if no action is taken, based on the results, not much will change at the moment in Woensel West in the current time. There will be high satisfaction and attendance. Woensel West is a neighbourhood with an average high amenity supply. However, in the future, the results show that fewer amenities are available and the pressure increases on the amenities, as the population increases, indicating the importance of taking demographics and accessibility into account.

In my research, I chose to exclude 'work' and 'living' from the operationalisation due to their complexity and unclear inclusion in studies related to the 15-minute city concept. 'Work' is particularly challenging to operationalise because of its variability and the nature of many jobs that may not be accessible within a 15-minute travel time, perpetuating some inequality. Similarly, 'living' was deemed infeasible and too extensive for this research scope, and I believe their inclusion would not alter the conclusions. However, future research should explore how these factors influence the 15-minute concept and cities. Another suggestion is to examine the distances and placement of amenities for walking and cycling, as the two modes yield different results in measuring accessibility. Considering the study results, I question the feasibility of achieving 100% accessibility and satisfaction for everyone, acknowledging that some inequality will always exist due to varying interests, needs, and preferences. This inequality is not nessisarily negative, as not everyone desires the same living environment.

Nonetheless, it is important to promote accessible amenities for different demographic groups and areas to reduce inequality and address demographic needs in amenity allocation. In addition, cities in the Netherlands currently allocate their amenities based on power relations and various interests, aiming to create an attractive establishment climate. At the same time, they need to address and act on the specific needs of different areas to enhance value. This requires finding ways to attract amenities effectively. Economic constraints often take precedence over residents' democratic input in urban planning and amenity placement. While I understand the focus on economic goals, I question if a better balance can be achieved to represent both residents' interests and economic objectives, ensuring a more equitable distribution of benefits in terms of People, Planet, and Profit within neighbourhoods.

To ensure validity and reliability, multiple methodologies were used to assess the needs of Woensel West residents across different demographic segments. During the drafting of the methodology and operationalization, careful consideration was given to selecting the best methods, relevant sources, and variables, as well as formulating appropriate questions for the research, interviews, and survey to obtain accurate results. These methodologies were developed based on literature and expert interviews to identify necessary research areas and gather required data. As a result, the research is generalisable for example, other neighbourhoods or the entire city, however, other results may occur in different geographical areas, as discussed in Chapter Three on validity and reliability as people are central in social studies.

The reliability of this study's results could be enhanced for two main reasons: First, despite receiving a higher survey response than expected, more responses would have increased reliability beyond the current 90% reliability rate with a 10% margin of error. Collaborating organizations helped distribute the survey, but ideally, posting letters to every household would have further increased responses and reliability. However, time and financial constraints prevented this. Second, the results would be more reliable if the sample size were expanded or merged with other target groups, potentially meeting assumptions and strengthening test validity and reliability. Considering an alternative test like Fisher's exact test or merging target groups could improve result validity. Despite these limitations, I believe the data supporting the conclusions are reliable, as specified, and do not affect the main conclusion.

Policy Scope and Recommendations

There are some implications when it comes to the placement of amenities, which is evident from the interview with policymaker 2, and the results of chapter 4.1. It is difficult to allocate amenities despite the municipality knowing that they should be placed. This is because on the one hand the municipality has a lot of power, by writing policy and making a zoningplan to point out where certain amenities should be located, for example greenspaces, public transport, shops, and healthcare amenities. However, their power is also limited conversely, as these amenities should be attracted by advantageous conditions that can be set by regulations the municipality, or government can offer. This indicates a certain balance of power and conditions that have to be favourable to both the government and market players for this to materialise in practice to meet these population needs. Besides, there also must be sufficient capacity in the market itself. An example in the Netherlands is the Netherlands' healthcare sector, where there are insufficient healthcare workers and, in Eindhoven, doctors to meet the demand for care. With future population growth, this will become more squeezing if the capacity does not change.

Therefore, my advice to the municipality is to ask more often *why* these amenities are not located in the area, and investigate what it takes to attract desirable amenities. Especially as the municipality has a certain responsibility in providing enough healthcare amenities to the residents of the city, for instance, certainly with the population growth concerned. Concerning the Woensel West situation specifically, I mean supermarkets, childcare sites, (outdoor) sports accommodations, and secondary schools within walking distance. It may be possible that an unattractive establishment climate for these amenities is present. This can be done by drawing up regulations, like how the municipality and the local housing association have previously done in Woensel West to attract businesses and target groups to the area. This aims to meet the needs of the population and achieve a higher level of satisfaction and accessibility, but also to keep the neighbourhood liveable and prepare for the future situation where the population has increased. Concrete examples from my research are to investigate why the desired supermarket has not established itself in the area, and what is needed to possibly influence the establishment within the desired area. But also the number of doctors in the city like Eindhoven and what might be needed to meet the needs of the population.

Besides of this recommendation, I recommend six actions more for the municipality of Eindhoven, Based on the results of this research and the survey: First, to conduct detailed follow-up research, and investigate why amenities to some extent are inaccessible within a 15-minute walking and cycling distance and for who concenring the Woensel West residents. By understanding the reasons behind accessibility and satisfaction scores, the municipality can better address the needs of specific target groups. Second, If relevant, conduct more detailed research on the target groups, focusing on the duration of their residence in Woensel West and their accessibility to various amenities. The current study's target group sizes are insufficient to make reliable statements about age-specific needs, so this could be explored in follow-up research. Third, consult local experts, by discussing the survey results, including the area director and the program manager, to validate findings and gather additional insights. This collaborative approach can help test and refine the results obtained from the study and survey. Fourth, using the survey results as a basis for determining local amenity policies or allocating amenities in Woensel West. Policymakers can form strategies to meet community needs in line with the municipality's broader strategy, considering the various stakeholders involved. By implementing these recommendations, the municipality can enhance the targeted allocation of amenities, ensuring they are placed in the right locations and meet the needs of the appropriate demographic groups.

Looking at the prioritisation of amenities that are desired within walking and cycling distance, my fifth recommendation is to look at the amenities that are most desired, in combination with those where there is low accessibility and low satisfaction for a higher expected impact on residents' accessibility and satisfaction. From the results these were: the supermarket, a drugstore, healthcare amenities, childcare locations, and sports amenities.

Placing these amenities in Woensel West will have more impact, due to relatively lower accessibility and satisfaction, than placing a pub, or a restaurant and other amenities for social gathering, in a place where there is already a high satisfaction and accessibility of amenities for social meetings.

Sixth, additional research can be done to test the 'nimby effect' of certain amenities, by conducting the same survey which is conducted during this research, but in other neighbourhoods and by analysing whether there are different ratios between the amenities desired within walking and cycling distance and what the reason for that is. If the same results are prevalent, this could indicate that the nimby effect might be the case. Another recommendation is to conduct more frequent bottom-up methods to measure the accessibility, satisfaction and needs of the amenities available to residents and to determine whether the supply of amenities is appropriate or whether additions are needed in other neighbourhoods of the city. Over time, this can be done again to see if there are changes in demographic composition, like an increase or decrease in population and demographic segments, as well as in the amenities offered in the neighbourhood and the level of accessibility, satisfaction and needs. If desired, the choice can be made to conduct focus groups, to measure more in-depth needs of the population, to collect arguments and take measures based on these. This can focus on the aforementioned issues, as well as other research purposes that are within this topic. This can ensure that amenities are located that add value based on bottom-up needs, rather than quantitative ones, that are not necessarily tailored to local needs or and therefore situated top-down. To properly match the allocation of amenities in the city in terms of quantity and location, based on the current number of residents, it may provide more insight to conduct this research on the entire city. This can lead to more insight, as it shows the whole city where and which amenities are less accessible, less represented in other neighbourhoods and desired, and to investigate by which target groups these amenities are not accessible. This makes it able to act and reduce spatial inequality and increase the access to the 15-minute city. Since this survey, it was chosen not to specify accessibility per amenity, as the survey would otherwise become too long, breaking down the amenity category in a new survey could provide a more specific picture and is a recommendation.

Concerning design standards, It should be noted that design standards are not the truth, as they only indicate the national average available supply. Design standards change over time, if they are measured again in the future as the market has changed. Design standards are therefore a tool to assess the presense of the amenties, that must be actualised over time. Therefore, my recommendation is to further develop design standards for the situation of Eindhoven. This would make it easier to estimate future amenity needs more accurately. However, design standards alone are not enough. Therefore accessibility numbers are vital and should be combined. If developed, these design standards together with accessibility results based on the bottom-up methodologies, could provide more insight about what is needed, within walking and cycling distance. Based on this, it is possible to act as soon as possible to ensure that certain amenities are developed as soon as the future need is there, to ensure the best possible match.

Regarding the 15-minute-city theory, I see challenges in economic, socio-cultural, spatial, administrative and political areas. Economically, as I indicated, I wonder to what extent 'work' can be involved as there are always exceptions and people have to travel further than 15 minutes for work. In addition, there needs to be sufficient capacity, or in other words, the right balance of amenities for as a surplus can lead to continuity barriers of amenities. Administratively and politically, there needs to be effective cooperation between different levels of government (national, and municipal) and stakeholders to entice amenities, making them locate in a particular area where they are desired by the population and implement the 15-minute concept. This will therefore require new regulations to implement the 15-minute city. The risk of this is that these regulations may encounter bureaucratic obstacles, such as resistance. Spatially, it can be a challenge to implement the 15-minute city, especially in densely populated cities where there is limited space and certain neighbourhoods cannot be directly transformed using the 15-minute concept, due to, for instance, existing infrastructure, divided ownership of real estate, or economic

circumstances. Socio-culturally, the challenges mainly concern community readiness in which they will experience and create more sense of community in neighbourhoods. On the one hand, while amenities can be facilitated, residents themselves should take the initiative to foster a sense of community with each other. Finally, residents should adapt their behaviour to use their cars less and make more use of local amenities, as this is what this concept aims to do. On the one hand, this requires changing habits; simultaneously, it emphasises the importance of amenities being tailored to local needs to influence this behaviour.

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Appendix

Appendix 1: Sustainable contributions of the 15-minute concept

In this paragraph, the sustainable contributions of the 15-minute city concept are further explained concerning the social, economic, and environmental dimensions of sustainability. Concerning the social dimension, the 15-minute city concept aims to include different classes including low-income and marginalized people (Moreno, et al., 2021; Reza Khavarian-Garmsir et al., 2023).

The proximity-oriented and compact design of the 15-minute city neighbourhoods provides social benefits at a close distance, reduces crime rates and advantages for public health (Reza Khavarian-Garmsir et al., 2023). It also increases opportunities for social encounters in public spaces like sidewalks and boosts the sense of identity. Moreover, concerning the economic dimension, the neighbourhood-level distribution of businesses and focus on proximity to the workplace can help 15-minute cities maintain economic viability while consuming less energy and reducing transportation-related emissions. Besides, localised amenities offer job opportunities to reduce time wasted in daily commuting (Reza Khavarian-Garmsir et al., 2023). There is evidence from the Chicago metropolitan area showing that job accessibility can reduce unemployment and poverty and increase opportunities (Moreno et al., 2021; Reza Khavarian-Garmsir et al., 2023). Individuals find jobs that match their skills, thus increasing economic productivity and reducing underemployment. Second, a 15-minute city allows dwellers to save on transportation expenditures that car-dependent households spend on fuel, car maintenance, and parking fees. Finally, the 15-minute city envisions affordable housing for low-income households and thus, is a pro-poor strategy that enables its residents to spend more on local purchases and support local businesses (Moreno et al., 2021; Reza Khavarian-Garmsir et al., 2023).

Moreover, the environmental contribution is addressed by decentralising urban services to reduce unnecessary travel across cities, expanding walking and biking paths, redesigning public spaces to discourage private car usage, and developing green paths (Reza Khavarian-Garmsir et al., 2023). The 15-minute city provides non-car owners with easier access to essential services within walking and cycling distances. Evidence from New Zealand, Doha and Barcelona suggests that active transportation can reduce overall vehicular traffic, energy consumption, and emissions. Besides, it encourages development in existing urban areas to support more efficient use of urban lands and reduce the pressure on suburban and agricultural lands (Reza Khavarian-Garmsir et al., 2023).

Therefore, it protects agricultural and rural lands from unregulated urban expansion (Reza Khavarian-Garmsir et al., 2023). The concept also can encourage walking and cycling, lowering transportation-related energy consumption (Reza Khavarian-Garmsir et al., 2023). Better uptake of active mobility modes reduces per capita energy consumption and lessens the pressure on public health systems (Shannon, 2019). Finally, active mobility modes are used in conjunction with public transportation in a 15-minute city to better connect neighbourhoods by improving the public transportation system. Therefore, the residents can move with minimum energy use and meet their daily needs locally, resulting in decreased air pollution, and carbon emissions. *Image 16* shows the sustainability contributions of the 15-minute concept (Reza Khavarian-Garmsir et al., 2023).

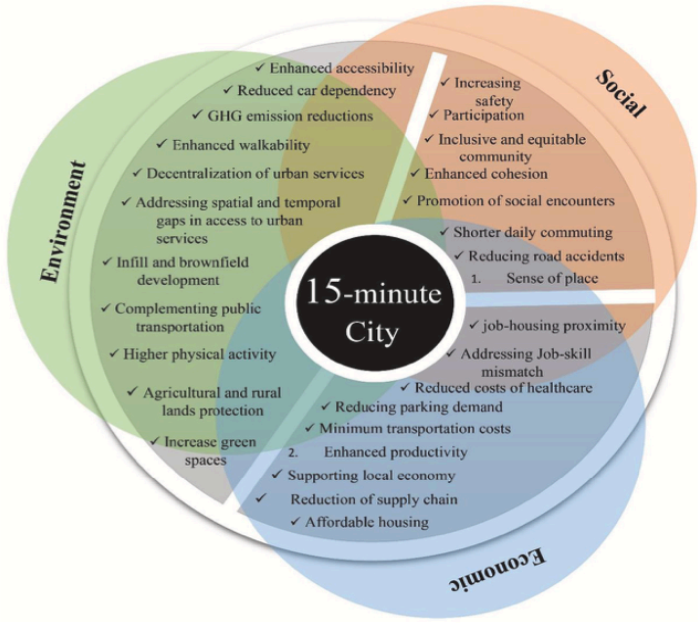


Image 16 Sustainability contributions of the 15-minute city (Reza Khavarian-Garmsir et al., 2023)

Appendix 2: Interview guide expert interviews policymakers concerning the research method.

This appendix describes the interview guide, questions and method sent to interviewees a week before the interview. This was necessary to prepare the interviewees for the interview. The interviews were conducted in Dutch, as this was the most accessible language. However, the questions were translated into English. It is important to introduce the topic and purpose of the study. The interview went as follows: first, the research was introduced, then questions were formulated regarding the theory of this thesis, and then the method was presented with additional questions for assessment and refinement if necessary.

Interview policymaker, Urban Planner and Urbanist

My name is Tom Dirckx, a student at Radboud University. I'm conducting scientific research on the integration of demographic data and design standards in the 15-minute city concept. My goal is to determine whether incorporating demographic data is important for allocating amenities, particularly in the case of Woensel West.

I'm testing my theory by comparing the results of demographics and design standards with the residents' needs through interviews with experts and a survey. From my research, a practical methodology emerges, tailored based on the interviews, which will lead to further recommendations for the scientific community. Additionally, I will implement the methodology itself and provide recommendations to the municipality regarding the potential needs for amenities of the local residents of Woensel West.

My aim is to refine or confirm my methodology, exploring both the scientific relationship through a suitable methodology and uncovering the residents' needs within the framework of amenities. This includes understanding current usage, residents' satisfaction with existing amenities, their accessibility, potential shortages, and their implications based on previous results derived from demographics and design standards.

For this study, I am mapping amenities within a 15-minute accessibility range, taking into account demographic data and local needs of specific population groups based on demographic characteristics. The reason I wish to interview you is because you are an expert from the municipality of Eindhoven, serving as a policymaker, planner, and urban designer. Therefore, I have prepared a set of questions and described a methodology that I would like to have evaluated.

This interview will be transcribed and coded afterward to ensure accurate interpretation for my research. Additionally, the interview will be anonymized to keep you unidentifiable. You are free to terminate the conversation at any time if you wish.

Firstly, I would like to ask for your permission to record this conversation so that I can listen to it afterward and incorporate it into my research. Do you agree with that?

Questions about theory

- Do you think the allocation of amenities plays a role in addressing the liveability issues in the neighbourhood?
    - Why?

- Do you believe the concept of the 15-minute city can play a role in improving liveability concerning the allocation of amenities?
    - Why?

- What factors do you think are important in allocating amenities in this regard?

- What do you think about using demographic data for allocating amenities in the neighbourhood?
    - Why?

- Would the allocation of amenities be fairer based on contextual information like demographics?
    - Why do you think so?

- Demographic data often involve the use of design standards. What are your thoughts on this?

- Why do you think these design standards are necessary?

- Do you believe design standards based on demographics are important for allocating amenities?
    - Why?

- How would design standards based on demographics assist in allocating essential amenities? And in the future?

- Do design standards actually reflect the needs?

- What measures would provide insight into measuring these needs?

Questions about method:

I've described a method scientifically suitable for assessing the needs for amenities among the population in Woensel West, categorizing the population into demographic groups. I shared this method with you earlier.

- What do you think about this method for identifying these needs?
- I need to create demographic groups in the survey. What categories do you consider important for this purpose?
- Do you have experience with such surveys?
- What should I pay attention to?
- How would you approach this?

Master thesis Tom – research and method to be assessed.

My research focuses on incorporating demographics into the 15-minute city concept. The 15-minute city is a new concept aimed at inclusive cities by providing all essential amenities within a 15-minute walking or cycling radius. Through this approach, everyone's needs are met by eliminating inconveniences caused by distance. Essential amenities include the following categories: healthcare and welfare, education, employment, public transportation, green spaces, daily-use shops, and dining establishments.

Moreno et al. (2021) argue that 15-minute cities contribute to three dimensions of sustainability: social, ecological, and economic. By making all essential amenities easily accessible, this will contribute to cleaner air, improved accessibility, stronger communities, reduced car usage, and increased green spaces. However, as it's a new concept, there is still room for improvement.

Literature on the 15-minute city does not incorporate demographic data, quantities, or volumes of amenities. Consequently, it's challenging to estimate the number of amenities the population needs to optimise the sustainability aspects in the city, ensuring everyone can access these amenities. Therefore, the main question of my research is: "What is the effect of incorporating demographic data into the 15-minute city on the allocation of amenities in Woensel-West?" To answer this question, several sub-questions have been formulated:

1. What is the context of Woensel-West regarding liveability issues and demographics?
2. To what extent does Woensel-West comply with the 15-minute city concept concerning amenities?
3. What are the needs of Woensel-West concerning amenities according to demographics and design standards now and in 2040?
4. To what extent are the needs of residents for amenities being met?

Research Method:

To answer these sub-questions and subsequently the main question, my research focuses on Woensel-West. Woensel-West is known as a (former) problem area and has been designated as a focus area in the environmental vision. This area has been selected because its liveability can be improved, and its allocation of amenities needs to be examined to determine if it meets the population's needs. Sub-question 2 assesses the neighbourhood's compliance with the 15-minute city concept based on literature. To test the neighbourhood, specific amenities falling under the categories have been selected. These amenities are measured within a radius of 1.2 kilometres (walking distance) and 3 kilometres (cycling distance) from a central point in the neighbourhood, representing the average distance for residents per dimension. Everything within this radius is marked to identify which amenities are potentially lacking or relatively less present according to theory. These less available amenities are then further examined to assess potential needs. This will be done through sub-questions 3 and 4.

Sub-question 3 calculates Woensel-West's demographic data with design standards to provide a minimum guideline and assess whether the current situation meets these guidelines. Additionally, it answers what these guidelines actually mean. This calculation will be based on current demographics and the predicted demographics for 2040. Design standards provide a guideline based on what is

minimally (legally) required and represent the current market situation of amenities. By calculating these design standards with the future population or household amounts, the current market situation is projected into the future. To prove what these design standards actually fulfill, sub-questions 4 are both theoretically and practically necessary.

Sub-question 4 measures the actual needs based on a survey of the population and provides results that answer the main question regarding the method and the relationship between the 15-minute city and incorporating demographic data. The survey categorises population groups based on age, income (and possibly other relevant factors) in the neighbourhood and asks about their needs and whether the selected amenities are accessible. Based on this information, sub-question 4 answers what the actual needs of the population are regarding amenity allocation, what the design standards mean regarding these needs, and what this means for the 15-minute city. By speaking with area coordinators from the municipality and the local housing association, the interests of residents regarding amenities can also be determined, providing additional insights alongside the survey.

Regarding the calculated amounts of amenities, this will confirm or identify differences that will then answer the main question: "What is the effect of incorporating demographic data into the 15-minute city on the allocation of amenities in Woensel-West?" Additionally, the method execution also clarifies what Woensel West needs in the matter of amenities within 15-minute walking and cycling.

In addition to answering the main question and outlining the method, this methodology will also be provided to the municipality to conduct further needs assessments on a larger scale for various types of amenities and at other locations. However, this method needs to be further evaluated/findings shared based on expert interviews with interview questions and this outlined method.

Appendix 3: Results of Expert Interviews with the Policymakers

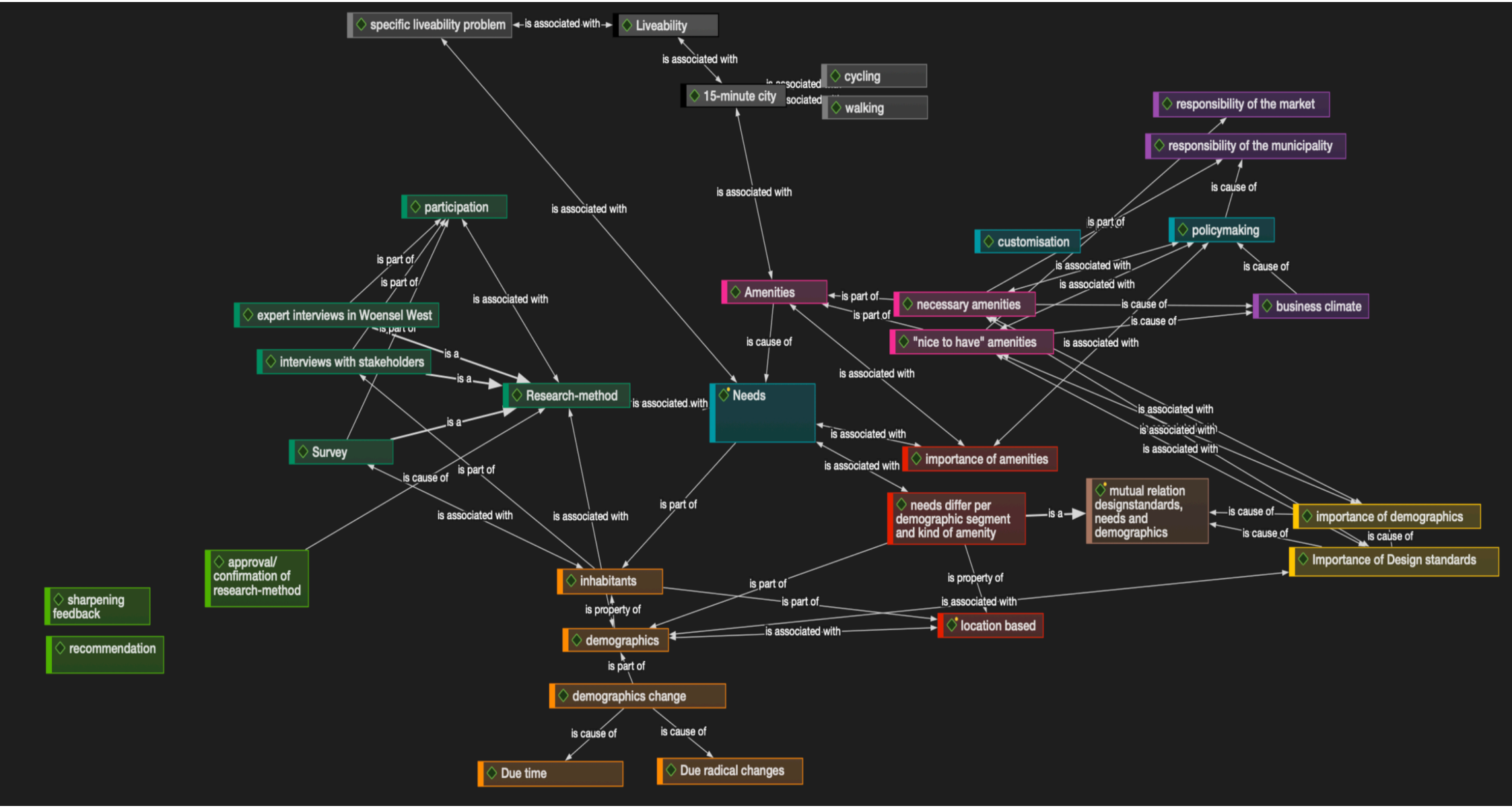


Image 17 Relation network interviews policymakers (2024)

Image 18 Code cloud

Results Expert Interviews; Policymakers of the Municipality

Results and explanation of the network manager

The focus of the interview was to get confirmation and apply triangulation to the research, meaning the theory, but also to confirm and sharpen the research method to measure "needs", the relationship to demographics and design standards, and the importance of matching the amenities to the needs of the residents. Therefore, as can be seen, "needs" took centre stage during the interviews. Looking at the the network at the top, the results show the reason for the research has to do with liveability, related to liveability problems in the broadest sense of the word.

Since liveability is broad, it varies from individual to individual, based on what they perceive as liveability. As a result, liveability problems are specific under a broad spectrum, due to the many different needs that often stem from specific needs. This specific need may in many cases call for specific amenities to solve this specific problem, as expert 2 points out:

> *"If you make amenities accessible to people, so, that they can cycle and walk within 15 minutes, say, that those amenities can come, so you also get that any liveability problems are countered. So, suppose you need care, for example, and you can walk to care within 15 minutes, you can solve problems with that. So indirectly, it thus yes has positive effects on any liveability problems."* (Interview 2)

> *"Yes, I do think there is just a relationship between how the amenities are and the liveability, it depends on which piece of that liveability those amenities* contribute to, or not." (interview 1)

For this reason, it is therefore necessary to tailor the amenities to the specific needs of the population. However, there are differences in the types of amenities. Therefore, Expert 2 indicated that it is good to distinguish between which amenities are needed and those that are "nice to have".

> "Everyone wants, a nice, cultural catering place, and food, but some are also needed. So, you have basic medical amenities, you just need them. So what is necessary and what is "nice to have". For example, the ATM is a "nice to have" amenity. It is not a basic amenity that you need. A doctor, however, is a basic amenity you need. (Interview 2)

Method

A method was developed to determine the needs in a particular area through participation via surveys on the one hand, and interviews with local experts conversely. I used surveys and interviews to gather opinions from residents and local experts, to justify the placement of amenities. By asking for opinions directly from residents, I aimed to gain an accurate understanding of their needs. Therefore, two local experts, the programme manager of the local housing corporation and the area director of the municipality were interviewed, because they have regular contact with residents and possess knowledge about local needs. Next to gather results, this is done to look for similarities with the survey, but also have useful information in case the survey gets insufficient response. Both experts agreed that this method provides a clear picture of the needs in the area. Overall, this approach of involving residents and local experts in determining needs was found effective.

> *"With that survey, you go and ask directly at the source. So if you get enough answers, then you just really know what the needs of the people themselves are, because you've asked the people themselves. And in doing that, you just really ask a few experts who are constantly working with those people in the neighbourhood, who might also just hear those kinds of questions and talk to them about that and be questioned by the people themselves on that. So, with that, you have a professional side and you have the residents themselves. So I do think that with that, you do get a fairly broad deployment, that you do get a fairly reliable answer of what the need is." (Interview 1)*

Survey

Experts admit to also using this method regularly with a survey of residents' needs, to substantiate a particular choice. When conducting the survey, it is important to pay attention to the length of the survey, otherwise residents will not want to fill it in. Besides it is also important to pay attention to the use of language and formulation during the survey:

> *"Ten questions. I think that's enough. That's also not too many and not too few. It is because you walk right through that. So, I think that's just fine. But if you made 20 questions, so to speak, people would say pfffff."* (Interview 2)

"It just must be understandable, because there is no need to mention words like 'composition' (difficult words), for example, because people don't understand that. (Interview 2)

In addition, it is important not to ask about some aspects, for example income or ethnicity, because this does not have to be relevant, or is not ethical, as Expert 2 says:

"Yes, I wouldn't go and ask about income, for example, then it sounds lame, but whether the work situation at all, the question of whether you should ask that because it is. Some people are uncomfortable with that. Culturally you have to pay a bit of attention so that it is indeed about yes, where are you from or something? That's, again I don't think that's actually a very relevant question. "Are you proficient in the Dutch language?" So that question is also all avoidance. It's not about that at all. It's more about, "they live in a neighbourhood" and "what do they need." And not, where are you from and what it is for income, things like that, then I wouldn't talk about all that." (Interview 2)

Conversely, other things are important to ask. For example, to age and whether people have children, as expert 1 points out*:*

"Yes, indeed, but I think mainly, because you're, you're in that target group and I think mainly it's always the adults who fill it out. I think it's important to know if they have children, yes or no. So that, that would also, because, for a number of amenities, it makes some difference whether you have children or not. Yes, school attendance will really have a different answer if you have children or not, so there is a link between that. So I think indeed age group is one of the most important, actually in that demography, yes." (Interview 1)

It should be noted, however, that a survey is not the truth, because you never reach everyone, you don't always know who fills it in, but also because multiple methods often give an overall picture about the needs of amenities.

"*Indeed, also maybe surveys, you always must be a bit careful with that, because who fills that in? Of course, so it can also be a tool, but for me, it should never be the truth"* (Interview 2).

In addition, there may be insufficient participation in the survey, which may have several causes, according to the experts:

"Then the question is whether it is an issue with residents, because why else would they not have responded? Then maybe there is no problem. Then they don't think it's important enough, so that could also be something like that. It's just not an issue, so it's too much trouble to fill it in. The moment they do find it an issue, they will probably also just start responding to it, because then they feel they have influence with that survey." (Interview 1)

Additionally, the level of response may depend on the neighbourhood, as there may be different reasons why people do not participate in the survey:

"It might be because of the in the neighbourhood".(Interview 1)

If response rates are low, additional methods may offer more insight, by interviewing other stakeholders, such as the shops, doctors, and other local experts, as expert 2 mentioned:

> "*I think interviews with stakeholders could also be interesting. So, not just people, so say a doctor's office, maybe also a shop and in the area to just interview people on that; how are those amenities used? So, to get more of a picture of usage."* (Interview 2)

Expert 1 also indicated that they did this with the formation of the environmental vision, where local needs are also important:

> "*With the formation of the environmental vision, they also just really hit the streets with letters and just questioned people, so you could indeed do that in the neighbourhood as well, question the people who go into the supermarket or the doctor's office, or whatever, at home, or maybe at the amenities themselves in some way see if you can do something with that, the amenities that are there. So that, yes, that would, but then it's going to take you a lot more time because that's a lot labour-intensive. (Interview 1)*

Needs, demographics and design standards

Expert 2 indicated that needs can vary by demographic segment and can change due to different events as well as over time and location.

> "*So, I think that design standards are basically based on partial assumptions, but you need those assumptions to be able to plan housing better, but also to plan amenities better. And how that ultimately develops is the question, because if you look at Meerhoven (neighbourhood) at the time, one large school was built there and now you see in practice that the need has actually become much greater. So that school is actually too small again. But it can no longer expand. So now emergency classrooms have been added, but suddenly that's going to weaken again and over time you want; because of demographics, hey, those kids are all leaving school. So as long as there are no removals in the neighbourhood, there is less need again. So actually, it's a kind of wavy movement, so you've used a prefix at some point, but over time it can therefore be adjusted again, but the growth is bigger as expected or smaller as expected. It's a market movement and of course that's also a bit of a discussion, then suppose you look 20 years down the road and then those people who are so with those children, leave the house, the neighbourhood again, so there are new families who also have children again and then it starts all over again. So actually, that's kind of yes, the tricky thing with those demographics and also those amenities. Some things are just not quite stable over time and that's not a bad thing either.* Amenities and demographics are also a lot of analysis work, so looking at things, looking back how did they develop? And keep monitoring." (Interview 2)

Both experts also indicate that location matters according to needs, demographics and design standards:

> *"If there are amenities that are suitable for families, then families are more likely to move there, or people who are planning to become a family, so to speak: then you are more likely to have*

a lot of children, as opposed to not having a lot of amenities. That's really in the centre. The centre of Eindhoven, where well De Knoop XL (project) sits there. If you are just going to build flats, small flats there, with no public space, you just know that families are not going to come there. Then maybe people are going to live together, they are going to have a child as soon as that child wants to walk outside a little bit. So from the age of three, then they will leave there because those amenities outside won't suffice then." (Interview 1)

Using demographic design standards therefore offers a good tool for estimating which amenities are needed, estimating the need, by population, by demographic segments, as both experts point out - "*To my mind, that's right, because I think... yes, the structure of certain neighbourhood that requires certain amenities. If there are a lot of children, then you also need a lot of amenities. That something with a playground something with also green spaces to play outside, also again schools, a library can that kind of thing. But if you have a lot of older people in particular, then you're sitting on totally different types of amenities. Then you are much more concerned with care amenities so that need is indeed part of the distribution of the neighbourhood. I can very well imagine that." (Interview 1)*

Both experts indicated that these design standards could estimate needs somewhat well, but always need to take into account the local context and tailoring is needed at the particular neighbourhood or location. From this framework, expert 2 indicated that there is an interrelationship between design standards, needs and demographics and that these factors are important for matching amenities to local *needs:*

"*I think the design standards are already good anyway, to start using, because we are getting a lot of housing as Eindhoven; 40000 housing units, Well 60 to 70000 inhabitants, that's so many inhabitants that we actually now really know that amenities need to be added. So we need the design standards to be able to predict what allocations need to be added, and then the demographics are an additional tool. So I think if you should start with the design standards first and then you could use the demographics in addition, but then you would actually have to give tailoring per neighbourhood. (Interview 2)*

Allocation of amenities

Placing amenities is not always one-sided and easy as a municipality. On the one hand, because some amenities can be placed by, for example, using demographic projections, encouraging market players and building. This process is fairly straightforward. Conversely, some amenities are market-driven, where these amenities need to be attracted by writing policy, changing the zoning plan, to create an attractive business climate, for example, and by negotiating with the developer or the entrepreneur, to encourage them to locate in a particular location, as expert 2 points out:

"Suppose, for example, someone likes to go to school or you want to read things, they can learn in every neighbourhood where there is a school, or in every neighbourhood there is a neighbourhood library, then you can access that in that way. And so in principle that is. On the one hand, we have policies as municipalities to spread amenities across the city. - "So, thinking about schools, so we will... So, based on (population) forecasts, they are allocated, but many other amenities are actually not allocated automatically. So, you actually need to develop

policies for that. And that's what we're going to do. We're going to work on the "Amenities Program" to actually encourage amenities to be better distributed throughout the city and allocated independently of any specific neighbourhood. But in part, we are thus responsible, for example, for schools and for emergency services. But partly, we are not responsible; the general practitioner's office chooses to establish itself in that neighbourhood. Of course, we can try to encourage that by saying, well, we have space available; would you like to establish your practice here? So as a government, we have some influence on that, but not entirely." (Interview 2)

"So, what's interesting is that when the municipality knows that there's development happening in a neighbourhood, you can also encourage developers to engage in discussions with, for example, medical practices, with dentists, to see if they could establish there as well. Of course, as a government, you can also say that we'll address it in the zoning plan, that a certain percentage of amenities must be provided in that way for a developer to comply. So, you can indeed provide a framework and stimulate things in that way (Interview 2)

Additional recommendations for research method

From the interviews, several other recommendations for the study emerge: Making a distinction between walking and cycling for two reasons. Firstly, because there is a significant difference between both dimensions, as the needs may vary between walking and cycling. And second, because Eindhoven relatively easily complies with the concept of a 15-minute city due to the size of the city and the concept:

"In Woensel West, you see that the centre falls under it, Strijp-S falls under it, the Kruisstraat falls under it, a large part of Eindhoven, so I also think it is good to make a distinction between walking and cycling." (Interview 2

Additionally, other recommendations include: To make a better estimation of the necessary amenities, it's important to know which amenities, in what capacity and quantity, are needed, as some amenities can be combined or expanded, as suggested by expert 2.

"Because unlike now, I notice that this isn't really being done, you know, for example, in large municipalities, they are very quantitatively focused, but of course, we also have many existing amenities and, well, based on demographics, very little consideration is given to determining that. So, I think that's something Eindhoven should start doing. Otherwise, you'll be adding amenities that may not be needed at all in that location." (Interview 2)

"Because what you see is, we have a lot of amenities that could still be expanded. So, for example, we have primary schools; many primary schools in Eindhoven have a large terrain and a large schoolyard. So, when you know that the primary school needs to double in size and you would do new construction on that location, you can utilise much more. So, you actually have an existing location that you can utilise much better. You can also create a schoolyard that is accessible to the community. By doing so, you utilise that amenity better, maybe eliminating the need to build a playground in the neighbourhood. And this is how we should start looking at things in the city, combining things with multiple uses of space, and integrating amenities

more into certain developments. Better utilisation of existing amenities is one of the steps in applying your indicators, so I see it as indicators, demographics, better utilisation of existing amenities, and only then can you really determine what you need because otherwise, you might be building for vacancies or have an amenity that just sits empty, which could be better utilised. Well, I think not enough attention is being paid to that at the moment. I do hope that in the future, there will be more focus on it." (Interview 2)

Conclusion

In conclusion, based on these interviews, it can be suggested that the experts approve of and find the research method suitable for the type of research being conducted. They believe that this method can ensure that the results from the survey and interviews provide a reliable outcome of the needs and an overall picture of which amenities are desired in the neighbourhood by the residents. However, a distinction should be made between essential amenities and 'nice to have' amenities. This distinction will also be made in the analysis of the results. In addition to the research method, they also support the theory I am investigating, that allocating amenities based on indicators and demographic data establishes frameworks, granting everyone access to the amenities they need. Furthermore, they believe that the allocation of amenities is fairer and thereby enhances the effectiveness focused on the specific liveability issues that these specific amenities contribute to.

Appendix 4: Survey guide, flyer, survey questions, and additional information

As indicated in the operationalisation, the survey should be fine-tuned to approach as many people as possible and to ensure that as many people as possible understand the questions to obtain more reliable information. In addition, the questions should be asked in the right way and the response options duly tuned per question to get the desired results and filter the relevant results. In addition, Outlook Forms make it possible to view the results using descriptive statistics.

In addition to what is shown in the operationalisation, Outlook Forms was used which makes it practically possible to filter relevant data from the respondents and also to find out information to make a better estimation regarding the scope of this survey and to know what the spread is through the area and, for instance, to know and/or speculate which demographic segments the respondents belong to and where these people live (based on postal code).

Therefore, the survey was divided into two sections, first asking their postal code, age, if they have children living at home and how long they have lived in the area. As an example, the postcode was asked, as it is important to know what kind of house someone lives in. This is because the neighbourhood consists largely of social housing. Also, based on the postal code, it can be found out whether someone lives in a freesector house. However, this is an example of the many questions to be able to place the respondent in a certain demographic segment and, based on this, to know what the distribution is within the Woensel West research area and find out what the needs are per demographic segment.

Moreover, het is belangrijk om te vragen hoe lang deze bewoners in de buurt wonen. Er is gekozen om een onderscheid te maken in de volgende categorieen:

- 1-2 jaar
- 3-5 jaar
- 6-15 jaar
- 15 jaar of langer

Next, in chapter two of the survey, the satisfaction and accessability of amenities within 15-minutes walking and cycling distance should be asked. Based on this, it can be ascertained whether the neighbourhood meets enough amenities, as it will become clear whether these amenities are also available to everyone, to then know to what extent the area meets the 15-minute city. Besides, when looking at satisfaction with the presence of amenities, combined with accessibility and group size where the particular amenity applies, it can be asked whether there is a certain priority per amenity, by looking at possible correlations. In addition, it is also necessary to look at the accessibility differences of amenities within walking and cycling distance and whether these are increasing to a large extent. If the differences are not large, one can also ask whether the priority is high to place this amenity in the future and whether it would be useful to place it. To complement this, it asks what amenities are desired within walking and cycling distance. All these results together form an overview of accessibility per target group (the length of time people live in Woensel West), per facility type. In addition, the level of satisfaction with the supply becomes clear and which amenities are wanted. Scientifically, these results help answer the main question and what is the importance of including demographic data for the allocation of amenities. Below, the questions were formulated in Outlook

Forms. In addition, the survey was distributed through a flyer with link and QR code, by the various methods mentioned earlier in *Chapter 3.*

The flyer that leads to the survey

Image 19 Flyer which is spread and leads to the survey (own design; Canva, 2024)

Several Facebook groups I spread the flyer in and contacts that helped me spread the survey.

In this section, the Facebook groups are displayed which I conducted, and proof that one Facebook group initiated to put the flyer in the newspaper of their neighbourhood. However, despite the helpfulness, the flyer is posted every 2 months and unfortunately resulted in this being too late to process. In addition, several contacts were approached in addition to this mailing, but I liked to highlight these because I felt they were very helpful and practical.

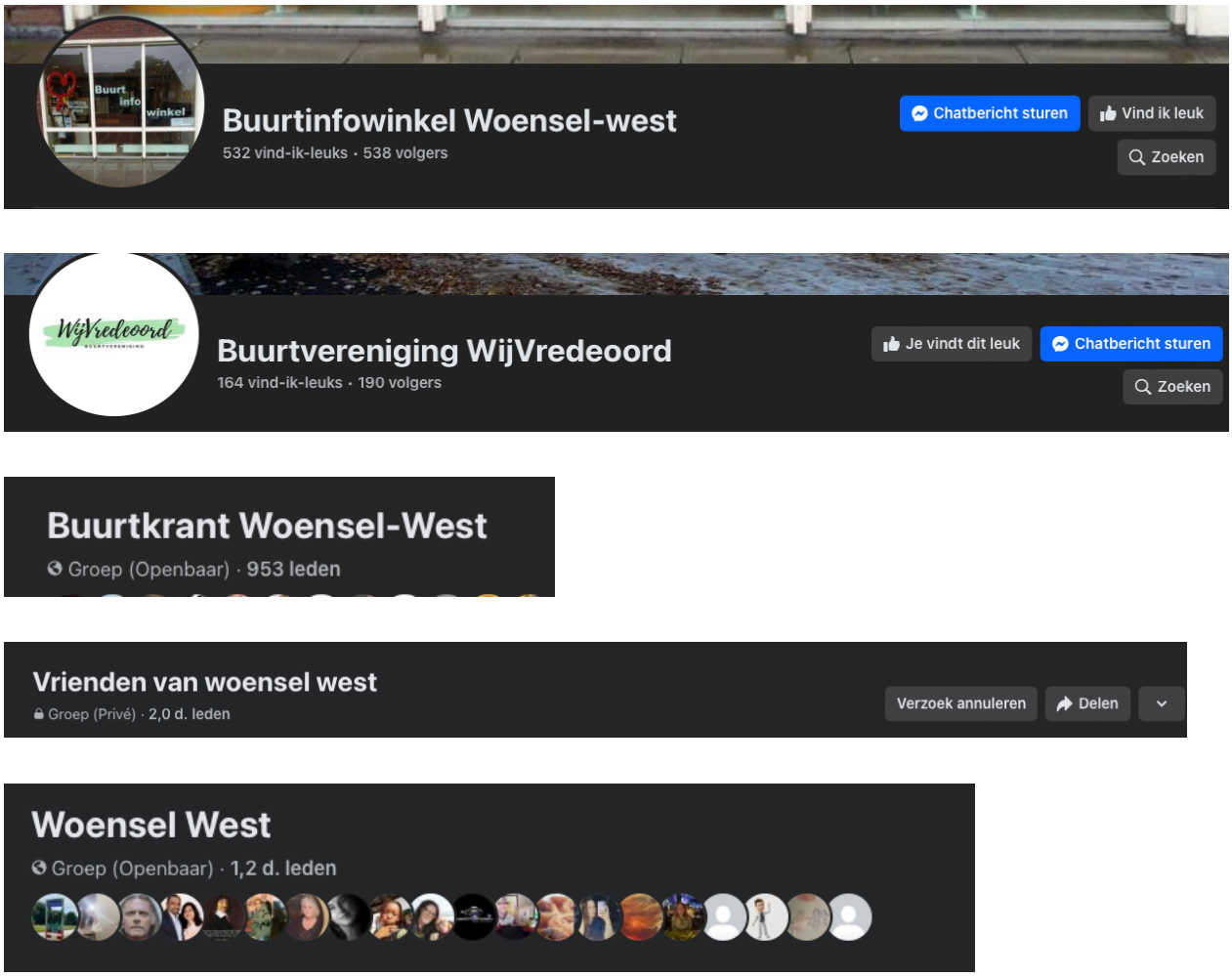
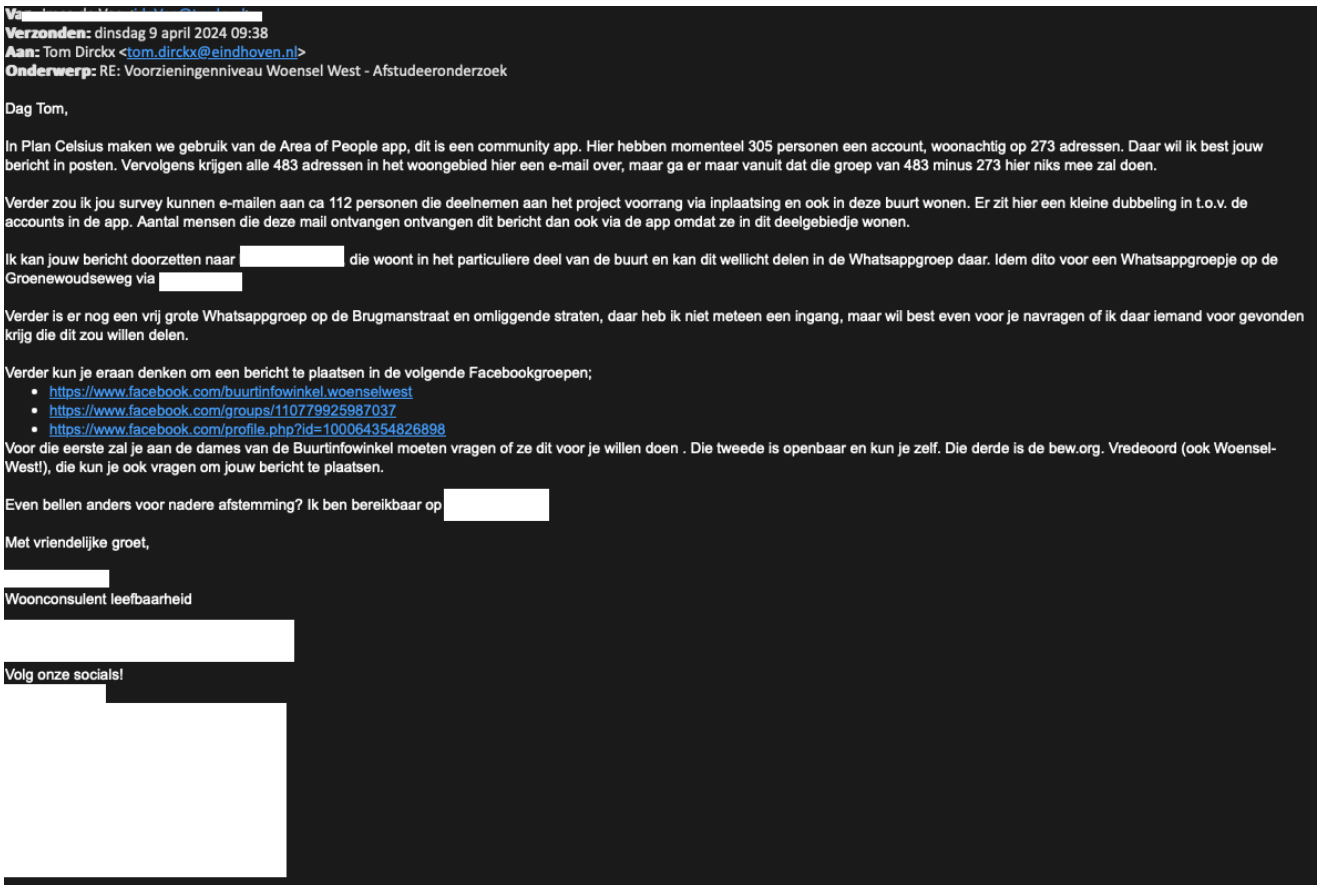


Image 20 Facebook groups (Facebook, 2024)



Verzonden: dinsdag 9 april 2024 09:38
Aan: Tom Dirckx <tom.dirckx@eindhoven.nl>
Onderwerp: RE: Voorzieningenniveau Woensel West - Afstudeeronderzoek

Dag Tom,

In Plan Celsius maken we gebruik van de Area of People app, dit is een community app. Hier hebben momenteel 305 personen een account, woonachtig op 273 adressen. Daar wil ik best jouw bericht in posten. Vervolgens krijgen alle 483 adressen in het woongebied hier een e-mail over, maar ga er maar vanuit dat die groep van 483 minus 273 hier niks mee zal doen.

Verder zou ik jou survey kunnen e-mailen aan ca 112 personen die deelnemen aan het project voorrang via inplaatsing en ook in deze buurt wonen. Er zit hier een kleine dubbeling in t.o.v. de accounts in de app. Aantal mensen die deze mail ontvangen ontvangen dit bericht dan ook via de app omdat ze in dit deelgebiedje wonen.

Ik kan jouw bericht doorzetten naar [redacted] die woont in het particuliere deel van de buurt en kan dit wellicht delen in de Whatsappgroep daar. Idem dito voor een Whatsappgroepje op de Groenewoudseweg via [redacted]

Verder is er nog een vrij grote Whatsappgroep op de Brugmanstraat en omliggende straten, daar heb ik niet meteen een ingang, maar wil best even voor je navragen of ik daar iemand voor gevonden krijg die dit zou willen delen.

Verder kun je eraan denken om een bericht te plaatsen in de volgende Facebookgroepen;

- https://www.facebook.com/buurtinfowinkel.woenselwest
- https://www.facebook.com/groups/110779925987037
- https://www.facebook.com/profile.php?id=100064354826898

Voor die eerste zal je aan de dames van de Buurtinfowinkel moeten vragen of ze dit voor je willen doen . Die tweede is openbaar en kun je zelf. Die derde is de bew.org. Vredeoord (ook Woensel-West!), die kun je ook vragen om jouw bericht te plaatsen.

Even bellen anders voor nadere afstemming? Ik ben bereikbaar op [redacted]

Met vriendelijke groet,

[redacted]
Woonconsulent leefbaarheid

[redacted]

Volg onze socials!

[redacted]

Image 21 Mailing concerning the spread of the survey in different platforms, through someone from the social housing corporation Trudo

The survey

The Survey can be accessed here: https://forms.office.com/e/WD2L7GiFy9

Tevredenheidsonderzoek voorzieningen Woensel West

Voor de gemeente Eindhoven doe ik onderzoek naar de tevredenheid van de bewoners van Woensel West over de voorzieningen in de buurt.

Graag hoor ik wat jij vindt over de voorzieningen mening over de binnen 15 minuten wandel- of fietsafstand die van je woning te bereiken zijn. Deze vragenlijst is bedoelt om te ontdekken hoe tevreden je bent over deze voorzieningen in de buurt en of ze toegankelijk zijn voor jou. Denk bijvoorbeeld aan voorzieningen zoals een supermarkt, bakker, school, park, dokter/apotheek, en meer.

We willen weten over welke voorzieningen je tevreden bent. ook willen we weten de voorzieningen beschikbaar zijn en welke voorzieningen je nog mist in je buurt. Met deze antwoorden kan Gemeente Eindhoven beleid schrijven over de voorzieningen in de buurt. Het invullen van deze vragenlijst is mogelijk tot uiterlijk 5 mei 21:00 uur.

Het invullen van de vragenlijst is vrijwillig en anoniem. Met de gegevens worden beschermd en van de resultaten wordt een algemeen rapport van gemaakt. Het is dus niet duidelijk wie de vragenlijst heeft ingevuld. Op dit onderzoek is de Algemene verordening gegevensbescherming van toepassing. De van jou verkregen gegevens worden onder strikte waarborging voor geheimhouding verwerkt en alleen voor dit onderzoek gebruikt. Voor meer informatie: eindhoven.nl/privacyverklaring.

Alvast bedankt voor je deelname!

T. Dirckx
Afdeling Omgevingskwaliteit
Gemeente Eindhoven

Image 22 Introduction of survey (own design; Outlook Forms, 2024)

Vragen over jezelf

We willen de antwoorden die je geeft over de voorzieningen in de buurt goed verwerken. Daarom hebben we enkele vragen over jezelf en je omgeving zodat we kunnen nagaan welke onderwerpen er bijvoorbeeld meer uitspringen voor jongeren of ouderen

1. Wat is jouw leeftijd? *

- ◯ Jonger dan 12 jaar
- ◯ 12 - 18
- ◯ 19 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ 50 - 59
- ◯ 60 - 69
- ◯ 70 - 79
- ◯ 80 - 84
- ◯ Ouder dan 85 jaar
- ◯ Wil ik liever niet zeggen

2. Hoe lang woon je in de buurt? *

- ◯ 1 - 2 jaar
- ◯ 3 - 5 jaar
- ◯ 6 - 15 jaar
- ◯ Langer dan 15 jaar

3. Heb je thuiswonende kinderen? *

In verband met sport en onderwijsvoorzieningen

- ◯ Ja
- ◯ Nee

4. Wat is je postcode? *

Bijvoorbeeld 1234 AB

Voer uw antwoord in

Image 23 questions 1, 2, 3, and 4 of the surevy (chapter 1) (own design; Outlook Forms, 2024)

Nu volgt een aantal stellingen over de voorzieningen binnen 15-minuten wandelen en fietsen

Deze stellingen gaan over jouw tevredenheid over de aanwezigheid van deze voorzieningenen en de mogelijkheid om gebruik te maken van deze voorzieningen binnen 15 minuten wandelen en fietsen van je woning. Zoals de bakker, supermarkt of dokter. De door jou opgegeven antwoorden geven ons inzicht of er voldoende voorzieningen in de buurt zijn en of deze ook beschikbaar zijn.

5. Nu volgt een aantal stellingen over je tevredenheid over de aanwezigheid van de voorzieningen, die binnen 15 minuten wandelen van je woning zijn. Geef per stelling aan in hoeverre je tevreden bent met de aanwezigheid van de voorziening.* *

**Klik bij elke stelling één antwoord aan.*

	Helemaal niet tevreden	Niet tevreden	Tevreden	Helemaal tevreden	Niet van toepassing / weet niet
Supermarkten	◯	◯	◯	◯	◯
Groen, zoals een park	◯	◯	◯	◯	◯
Sportvoorzieningen	◯	◯	◯	◯	◯
Speeltuinen en speeltuintjes	◯	◯	◯	◯	◯
Speciaalzaken, zoals de bakker, slager etc. en detailhandel	◯	◯	◯	◯	◯
Bushaltes	◯	◯	◯	◯	◯
Mogelijkheden voor sociale ontmoeting, zoals cafés, restaurants, buurthuizen, jongerencentra	◯	◯	◯	◯	◯
Zorgaanbod, zoals dokter, fysiotherapeut, psycholoog etc.	◯	◯	◯	◯	◯
Kinderopvanglocaties, zoals kinderdagverblijf en/ of buitenschoolse opvang	◯	◯	◯	◯	◯
Basisscholen	◯	◯	◯	◯	◯
Middelbare scholen	◯	◯	◯	◯	◯
Het totale voorzieningenaanbod	◯	◯	◯	◯	◯

Image 24 question 5 and the start of chapter 2 of the survey

6. Nu volgt een aantal stellingen over je tevredenheid over de aanwezigheid van de voorzieningen die binnen 15 minuten fietsen van je woning zijn. Geef per stelling aan in hoeverre je tevreden bent met de voorziening.* *

**Klik bij elke stelling één antwoord aan.*

	Helemaal niet tevreden	Niet tevreden	Tevreden	Helemaal tevreden	Niet van toepassing / weet niet
Supermarkten	◯	◯	◯	◯	◯
Groen, zoals een park	◯	◯	◯	◯	◯
Sportvoorzieningen	◯	◯	◯	◯	◯
Speeltuinen en speeltuintjes	◯	◯	◯	◯	◯
Speciaalzaken, zoals de bakker, slager etc. en detailhandel	◯	◯	◯	◯	◯
De bushaltes	◯	◯	◯	◯	◯
Mogelijkheden voor sociale ontmoeting, zoals cafés, restaurants, buurthuizen, jongerencentra	◯	◯	◯	◯	◯
Zorgaanbod, zoals dokter, fysiotherapeut, psycholoog etc.	◯	◯	◯	◯	◯
Kinderopvanglocaties, zoals kinderdagverblijf en/ of buitenschoolse opvang	◯	◯	◯	◯	◯
Basisscholen	◯	◯	◯	◯	◯
Middelbare scholen	◯	◯	◯	◯	◯
Het totale voorzieningenaanbod	◯	◯	◯	◯	◯

Image 25 Question 6 of the survey (own design; Outlook Forms, 2024)

7. Nu volgt een aantal stellingen over de mogelijkheid om gebruik te maken van de voorzieningen die binnen 15 minuten wandelen van je woning zijn. Kan je gebruikmaken van de volgende voorzieningen, of zijn ze vol? Geef per stelling aan in hoeverre je gebruik kunt maken van de voorziening* *

**Klik bij elke stelling één antwoord aan.*

	Niet	Wel	Niet van toepassing / weet niet
Sportvoorzieningen	◯	◯	◯
Mogelijkheden voor sociale ontmoeting, zoals cafés, restaurants, buurthuizen, jongerencentra	◯	◯	◯
Zorgaanbod, zoals dokter, fysiotherapeut, psycholoog etc.	◯	◯	◯
Kinderopvanglocaties, zoals kinderdagverblijf en/ of buitenschoolse opvang	◯	◯	◯
Basisscholen	◯	◯	◯
Middelbare school	◯	◯	◯
Het totale voorzieningenaanbod	◯	◯	◯

8. Nu volgt een aantal stellingen over de mogelijkheid om gebruik te maken van de voorzieningen die binnen 15 minuten fietsen van je woning zijn. Kan je gebruikmaken van de volgende voorzieningen, of zijn ze vol? Geef per stelling aan in hoeverre je gebruik kunt maken van de voorziening* *

**Klik bij elke stelling één antwoord aan.*

	Niet	Wel	Niet van toepassing / weet niet
Sportvoorzieningen	◯	◯	◯
Mogelijkheden voor sociale ontmoeting, zoals cafés, restaurants, buurthuizen, jongerencentra	◯	◯	◯
Zorgaanbod, zoals dokter, fysiotherapeut, psycholoog etc.	◯	◯	◯
Kinderopvanglocaties, zoals kinderdagverblijf en/ of buitenschoolse opvang	◯	◯	◯
Basisscholen	◯	◯	◯
Middelbare school	◯	◯	◯

Image 26 Questions 7 and 8 of the survey (own design; Outlook Forms, 2024)

9. Welke voorziening zou je graag hebben binnen 15-minuten wandelen of fietsen? *

**Klik bij elke voorziening één antwoord aan.*

	Wandelen	Fietsen	Niet van toepassing/ weet niet
Supermarkt	◯	◯	◯
Drogist	◯	◯	◯
Overige detailhandel	◯	◯	◯
Dokter	◯	◯	◯
Apotheek	◯	◯	◯
Tandarts	◯	◯	◯
Buurthuis	◯	◯	◯
Consultatiebureau	◯	◯	◯
Psycholoog	◯	◯	◯
Verloskundige	◯	◯	◯
Restaurants en café's	◯	◯	◯
Tentoonstellingsruimte	◯	◯	◯
Museum	◯	◯	◯
Sportschool	◯	◯	◯
Gymzaal	◯	◯	◯

Image 27 additional question to acquire additional needs of the inhabitants of the neighbourhood (own design; Outlook Forms, 2024)

Speelplekken	◯	◯	◯
Sportveld	◯	◯	◯
Basisschool	◯	◯	◯
Middelbare school	◯	◯	◯
Anders	◯	◯	◯

10. Indien je de optie 'anders' hebt ingevuld bij vraag 9, wat is deze voorziening? *

Heb je geen 'anders' ingevuld bij de vorige vraag, vul dan n.v.t. in

◯ N.v.t.

◯ Andere

11. Je bent aan het einde van de vragenlijst gekomen. Heb je nog opmerkingen of suggesties? *

Voer uw antwoord in

Image 28 Questions 10 and 11 of the survey (own design; Outlook Forms, 2024)

Appendix 5: Interview guide expert interviews with the local experts

In this appendix, the interview guide is formulated about the questions which are important to ask, to gather contextual information about the neighbourhood, the needs of the community, the presence of amenities and the way how they manage the neighbourhood, which is important to answer sub-question 1 and 4.

Interview questions Programme manager of the neighbourhood organisation/ local housing corporation.

My name is Tom Dirckx, student at Radboud University and doing my graduation internship for my master's thesis at the municipality of Eindhoven. I am doing scientific research involving demographic data and design standards in the 15-minute city. I aim to find out whether involving demographic data and design standards is important for allocating amenities and in this case in Woensel West.

I test my theory by comparing the results of demographics and design standards with the needs of residents, through interviews with experts and a survey. A practical methodology emerges from my research, fine-tuned from the interviews, in which I came up with further recommendations for science, but also to the municipality for improving the neighbourhood.

I aim to find out what the needs of residents are within the framework of amenities, what is currently being used, what is residents' satisfaction with the amenities that are currently there, whether they are accessible, but also therefore whether there is a shortage and what this says based on the previous results I have based on demographics and design standards.

For this study, I map amenities within 15 minute accessibility. In doing so, I also involve demographics and local needs of certain population groups are important based on demographic characteristics. The reason I want to interview you is because you are an expert from the local housing association as a programme manager in the neighbourhood organisation. Therefore, I have prepared some questions where you will help me further in the research. In particular, these questions focus on local needs and what is currently being done to improve this. This interview will take a little over half an hour.

Firstly, I ask if I have your permission to record this interview so that I can listen back to it afterwards and incorporate it into my research. Do you agree to this? This interview will be transcribed and coded afterwards so that I can properly interpret the information for my research. This interview will also be anonymised, leaving you unrecognisable.

Questions

- **Who are you and what do you do as a function?**
- **What have you done in Woensel-West?**

(I understand that the neighbourhood is going through some transition, because in the past its liveability was a bit less.

- **What problems do you think are currently going on in the neighbourhood?**

- **What do you think is causing this?**

- **Platform 31, in its document on the neighbourhood organisation, talks about the commitment of the neighbourhood organisation, which plays mainly on social aspects, such as helping with vocabulary, education and such programmes, but also about the placement programme and making property available for users and activities. Could you tell me more about this through examples?**

- **Do you think the amenities have played a role in improving liveability in the neighbourhood?**

- **What has been done to improve the liveability of the neighbourhood?**

- **Do you think the allocation of amenities plays a role with addressing the liveability of the neighbourhood?**
    - **Why?**

- Research from various databases and research based on the 15-minute city shows that the neighbourhood is well provided with amenities and the surrounding neighbourhood. However, I wonder if the residents of this neighbourhood feel the same.
    - Do you know if that residents are satisfied with the amenities available in the neighbourhood?
    - Do they make use of the amenities available in surrounding neighbourhoods within 15-minute cycling or walking distance?

- Do the residents of this neighbourhood need a certain type of social amenity?

- Are there recurrent wishes from residents about the amenities offered in the neighbourhood?

- Are there population groups that are less represented in the neighbourhood in terms of the accessibility of these amenities? Think young people, children, the elderly, people from non-Western backgrounds (people of other ethnicities)

- Are there neighbourhood apps/ platforms that I can use to conduct my survey in?

Appendix 6: results and methods of the community organisation Woensel West

To complement what the Woensel West neighbourhood organisation has done and continues to do to improve the living environment of Woensel West, below are some methods and results described in more detail that provide additional contextual information about the neighbourhood that further inform the needs and choice.

Steering, coordinating organising and connecting.

Much of the work done by the neighbourhood organisation is visible (Platform31, 2023). However, an important part of the work is also less visible and therefore less quantifiable. Activities must be organised where the neighbourhood organisation facilitates in applying for permits. Before the neighbourhood organisation started, parties did not know how to find each other. Now they work together for a better Woensel West- making police care and education even better able to do their jobs. The neighbourhood organisation plays an important role in connecting different players in the neighbourhood and works effectively with them (Platform31, 2023).

Focus points of Woensel West

Resistance from (some) of the native residents: they felt at times pushed away (and jusit less represented) by the neighbourhood organisation and the insertion programme (a.o. by rent reduction). It is important to always remain attentive to the emotions people have about changes in their neighbourhood (Platform31, 2023)

- There are still a lot of problems in the neighbourhood in terms of poverty, addiction, (mental) health, debt/benefit, just to name a few. These issues have a huge impact on the quality of life of people and their children; even at the start of the neighbourhood organisation, the organisation knew that this would be a difficult issue. In addition, a large proportion of people are difficult to employ. Therefore, in recent years, through the initiative Celsius 360 and later the corporatised neighbourhood workroom 360, the neighbourhood organisation focused on combating social exclusion. This is a community centre organised by residents, for residents (Platform31, 2023)

- There are residents that the neighbourhood organisation does not reach. Certain groups do not feel connected to the neighbourhood organisation, which could widen the gap between those groups and the rest of the neighbourhood (Platform31, 2023).

- In discussion, mention that many of these issues are related to social problems (Platform31, 2023)

Results are due to the collaborative governance between the organisations.

Table 41 Results due to collaborative governance between the organisations.

Condition of the neighbourhood		
Domain	**2007**	**2023**
Education and upbringing	Due to nuisance in the neighbourhood, the school moved out of the area. The quality of education is low. The relocated school is even put under guardianship.	The school is back in the neighbourhood. The quality of education has greatly improved. Cito scores are relatively high. The number of young people with start qualification is increasing.
Safety and crime	Residents experience many physical and social nuisances. In particular, the arrival of heroin prostitution causes a lot of nuisances in the neighbourhood.	Crime registration shows that numbers are falling. Children are playing in the streets again.
Society and integration	Many residents want to move out of the neighbourhood. Only a small group of residents are active in the neighbourhood	People are enthusiastic about the neighbourhood again. The neighbourhood has the highest number of volunteers in Eindhoven. Distrust towards the government is decreasing.
Health, care & assistance	A relatively large number of residents report moderate to poor health. People tend to be less mentally healthy and smoke or use more drugs on average (2014 figures)	There is better coordination between professionals and people's health is relatively high compared to surrounding neighbourhoods. There is a neighbourhood sports club that focuses primarily on increasing sports participation in the neighbourhood.
Living environment	The public space is car-oriented and has few amenities.	Public space has improved. There is more space for playing and meeting.
Living and working	The housing stock is outdated. Incomes are low and a large percentage of residents are not working.	The housing stock has been (partly) improved and made more sustainable. More and more people want to live in the neighbourhood. There is renewed activity in the neighbourhood and labour participation is higher.

Appendix 7: Images of the available amenities within 15-minute walking and cycling distance from Woensel West

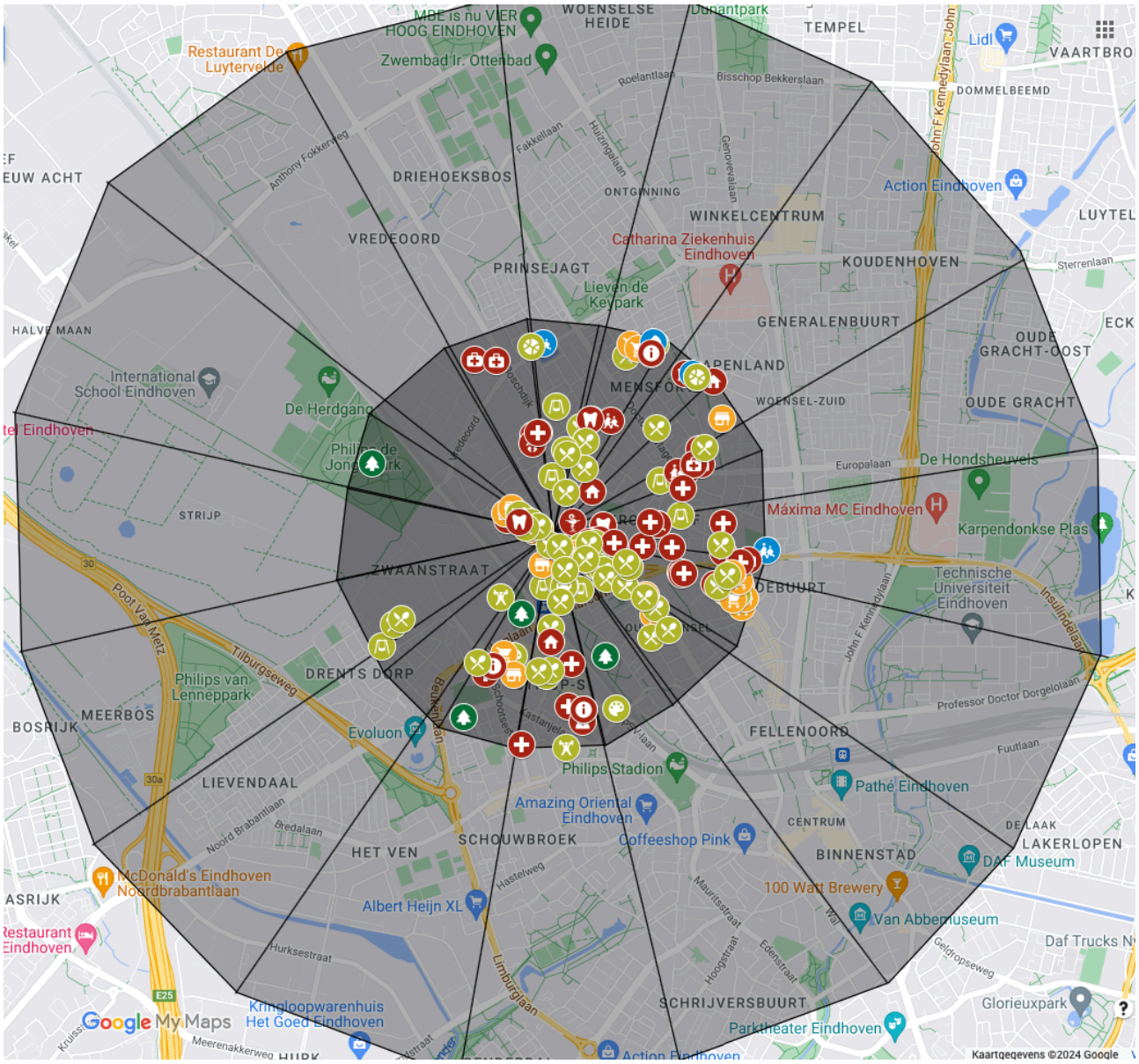


Image 29 Amenities within walking distance

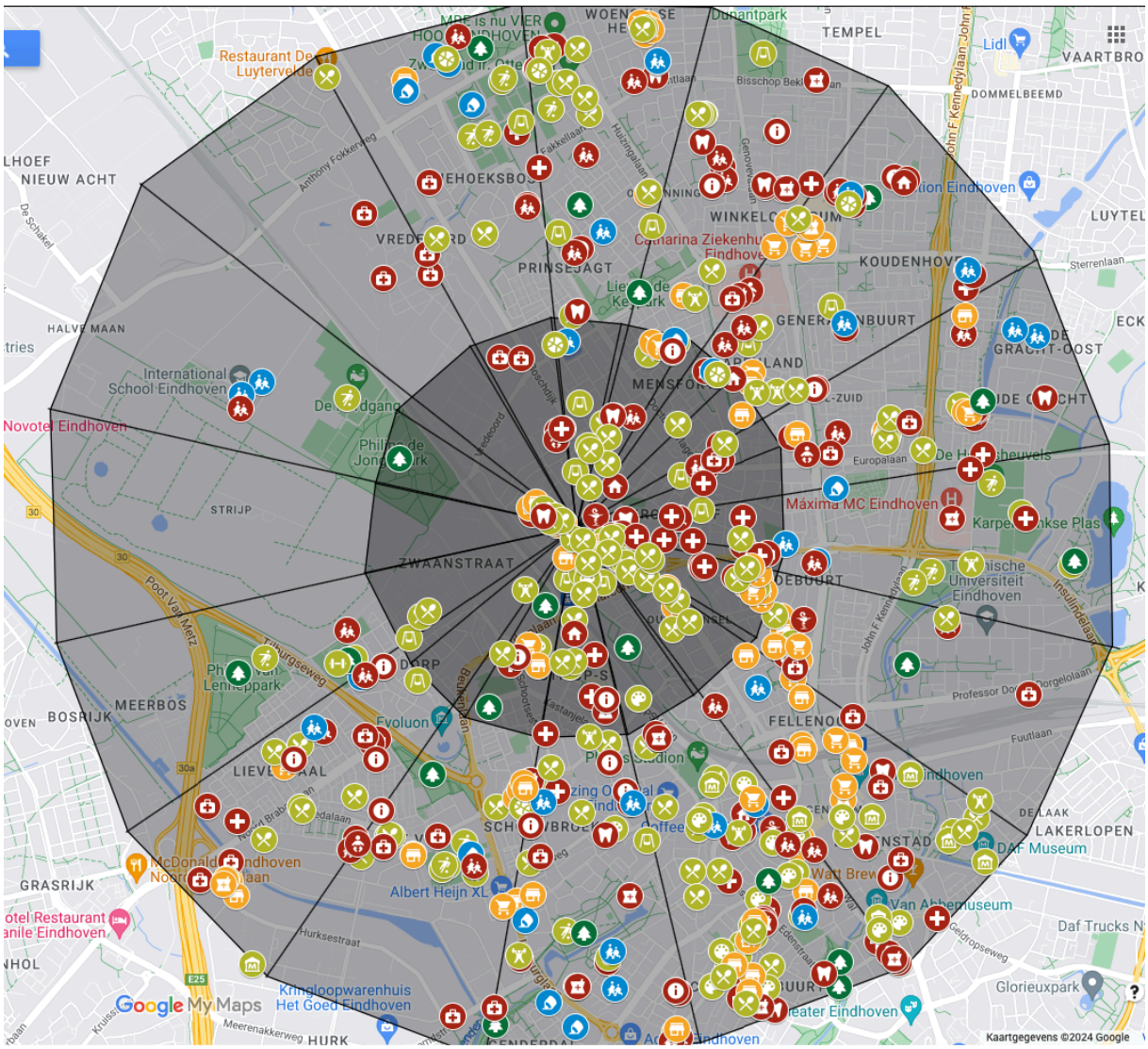


Image 30 Amenities within cycling distance

Link to map:

https://www.google.com/maps/d/edit?mid=1zwio6NuJaggfxCOBTy6RhY4HAOLSmhA&usp=sharing

Appendix 8: Interview local experts about needs and context.

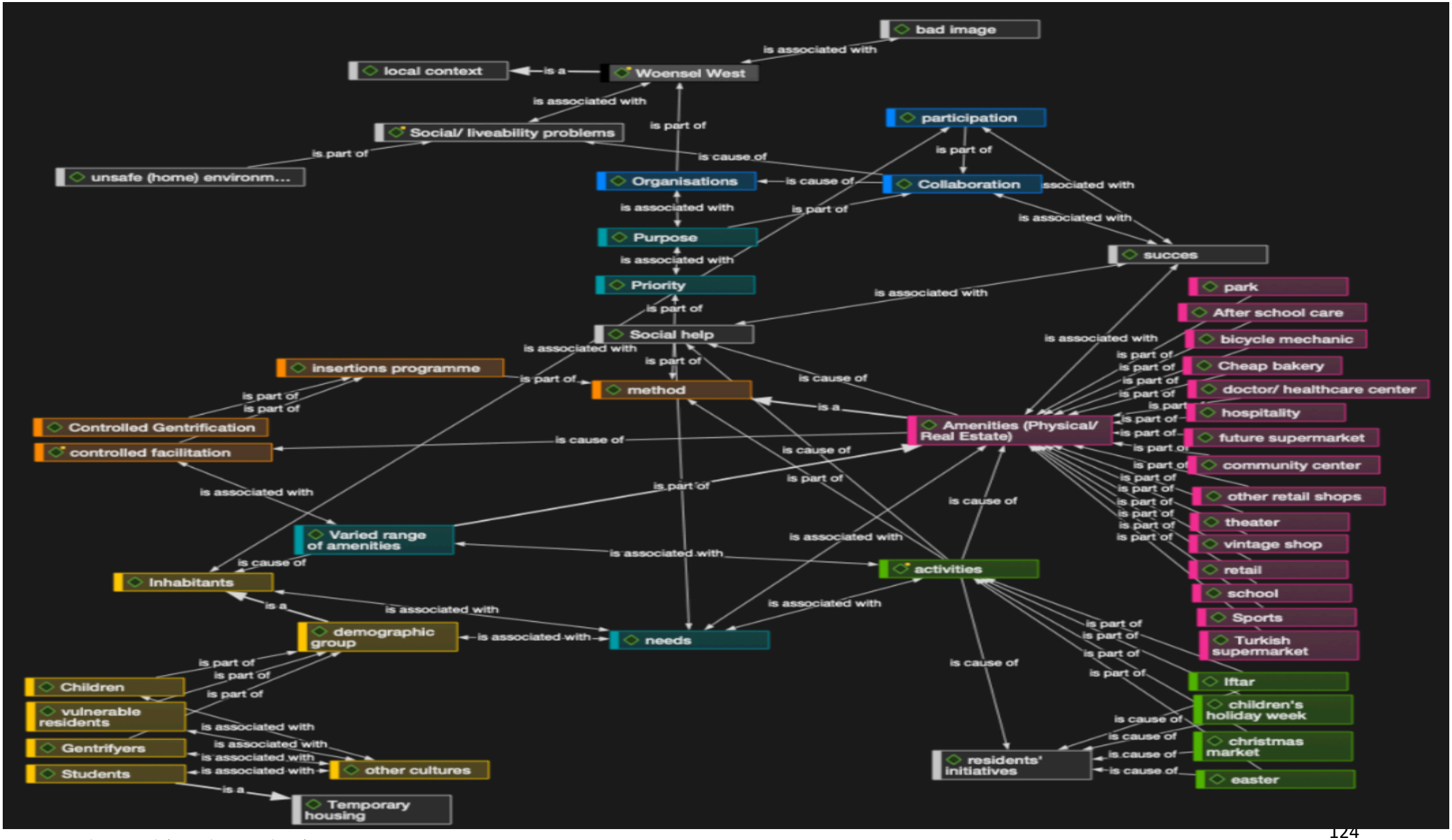


Image 31 Code Network (Own design; Atlas.ti)

Image 32 Code Cloud expert interviews with local experts (Atlas.TI, 2024; Own work)

Introduction and background

Looking at the code network, the code network starts from the local context: Woensel West. From the research with the experts interviewed from the neighbourhood organisation and are seconded from the municipality and the local housing corporation. In Woensel West, organisations are operational because of their geographical connection to the area, but also because of their own goals. The neighbourhood was in a very bad state 20 years ago, it was unsafe, unattractive to residents and organisations because of this insecurity, because of nuisance and thus had a bad image.

Collaboration

However, since the start of the cooperation between the municipality, the housing association and network partners, according to experts and various reports, a lot of progress has been made when it comes to addressing certain liveability problems, such as nuisance, insecurity, disadvantages of certain target groups, individual problems, which occurred on a relatively larger scale in the neighbourhood and could cause nuisance. These residents thus needed various physical amenities or social assistance, according to the programme manager:

> *"In the first period, we were mainly concerned with security. So, then we (the cooperation). That was during the rise of heroin prostitution to bring a lot of cheap heroin to the Netherlands. That was a problem in all big cities, in Eindhoven too and especially in this neighbourhood. And when we got that under control, then we agreed with the municipality of how we were going to work together to... Not only to bring back security, but also to improve the neighbourhood as a whole, because there were a lot of problems in terms of housing, in terms of work, in terms of income and the living environment the whole infrastructure required renewal, and that's*

where we In 2009 (when the residents' association was started as a formalisation of cooperation) and we started doing that. So, the first five years we mainly put things in order, then started improvement." (Interview 3)

But, at the beginning was the neighbourhood approach there was no good cooperation between these parties, according to the programme manager and area director. Organising this cooperation was therefore also a priority, as this cooperation is very important for improving the neighbourhood, as the programme manager points out:

"By organising that whole network, if 90 professionals are working in the neighbourhood in the social field and they don't know what they are doing from each other, you are not making any progress. Then you are a bit of a faucet mopping up. So, organising that network, we had already done that here before the neighbourhood teams were in place because that was the second priority. The first (priority) was investing in youth. Well, if you take another step more abstractly, in the approach we did decide together with the municipality. We will give investing in people a higher priority than investing in bricks. So of course, public spaces must be improved. Of course, we need to renovate the bad houses, or demolish and rebuild, but investing in people is an even higher priority than that." (Interview 3)

The cooperation between organisations is good, but also the deployed staff who are part of these organisations, according to the experts, make the biggest impact through this route:

"So, the consultation hours are all in the neighbourhood now and we are trying to make sure that that the best people are also put on the toughest neighbourhoods and that that network is organised. So that everyone is in touch with each other and can be reached quickly." (Interview 3)

"There is a very solid network in Woensel West. Anyway, I noticed; that something is starting to shift, but before it was definitely that there were only seniors there within and field of expertise. That is also, of course, because there are, quite a few complex issues, this is needed behind the front door. So, it's not an area where a Junior or someone starting their career is going to work immediately Nine times out of ten. So, that immediately indicates the quality of the network. In addition, with that start of that restructuring, a start has also been made to invest in that network." (Interview 4)

"And so that, that the network is very solid, that also means and that seniority that people know how to find each other and that also means that there are short lines of communication. Usually, people have been working in the neighbourhood for a while, they know the neighbourhood really well. And the moment a new person arrives, who is perhaps less familiar with it, you see that that network, which is so solid, does pull that through. (Then the seniors help the new employee, giving him the right knowledge)". (Interview 4)

Progression of the collaboration and participation

The aforementioned problems are the reason that the cooperation was created from within the organisations, to remedy and improve these problems through participation with the population. The

programme manager indicates that the long-term cooperation has borne fruit and is successful, due to bringing back and managing the security in the neighbourhood. As said before, safety remains an important issue, however, compared to other neighbourhoods, Woensel West is not different from others anymore as we look at nuisance issues (Interview 3). In addition, providing the right amenities is possible through constant contact with residents, or Participation. So, this is important to identify the several needs and meet those specific needs. The area director and programme manager therefore also state:

> *"I see it (my function) myself mainly as the bridge from inside to outside and from outside to inside (being the contact between residents and organisations). There are some things in there that you see everywhere, independent of the area. It is a piece of signalling function, connecting, certain initiatives that come to me first, but the role is also broader in practice. I notice when people get stuck in processes or are dissatisfied with something, it mainly comes to me as well. That is about all kinds of initiatives that residents can have, so that can be on green spaces or activities, or yes, as broadly as possible! But often it is also when 'people' do not get any further. I am also here often. With that, I also hope that this also makes it a bit more visible to some extent that people also do that more easily (contact the municipality)."* (Interview 4)

The cooperation aimed to improve the neighbourhood, by providing social assistance and investing in physical amenities (real estate). Bringing back a solid base would provide room for making the neighbourhood attractive for people, and organisations/ amenities to do business. Besides, due to investing in the base, the neighbourhood eventually becomes a better place as a whole, in its image changes, according to local experts, as said before in chapter 4.1 (Interview 3; Interview 4). Therefore, the priority was relatively more on social assistance, compared to investing in (physical) amenities, to regain security in the area, the programme manager said:

> *"We are going to give investing in people a higher priority than investing in bricks (real estate). So, of course, we need to improve public spaces; of course, we need to renovate the bad houses, or demolish them and build new ones. But investing in people is an even higher priority than that. Because, yes, of course, the other was also a problem, so we cannot say, we only do one, of course, we have to do both. Accessibility of the amenities aimed at vulnerable residents (people who experience livelihood security challenges)"* (Interview 3).

Methods

Gentrification

Besides cooperation and participation, this improvement has been carried out through various methods. Namely, through a placement programme, where under conditions, planned gentrification or controlled facilitation takes place. In controlled gentrification, certain people are placed/attracted in the neighbourhood who make contributions to the neighbourhood, through volunteering (directly), or by belonging to a certain demographic segment (indirectly).

> *"Woensel West is not just social housing, there is 30 per cent is just owner and occupier, owner mostly. And yes, they are in a different category, so the neighbourhood is also differentiated."* (Interview 4)

Researcher Tom Dirckx: "Right, my understanding is that because of the new housing development and because of the amenities, that there's a certain yes, that a different kind of people come to it as well."

Programme Manager Community Organisation/ local social housing corporation: "A different influx."

Researcher Tom Dirckx: "And yes, a kind of Gentrification also takes place?"

Programme Manager Community organisation/ local social housing corporation: "Yes, look in any case, we control that process" (Interview 3)

Insertion programme

Therefore they control the process, with the insertion programme originating from the goal of investing in youth, by organising activities (activities in the broadest sense of the word), and looking for volunteers to organise them for the youth.

"The aim was to invest (in the youth) in such a way that they can also participate and not have unjustified disadvantages. And from that observation, we said: of how can we now set up those activities? And from that motive, that insertion program was started. Like: what now? If there are people who are willing to invest time and energy in the neighbourhood if we allocate them houses with the agreement that they will have a lower rent. We never talk about rent reduction ourselves, because the rent is just the rent of the property it has. So, we determine whether that (the rent) is a bit lower or a bit higher, but so those (residents from a different demographic segment) get a lower rent and an exchange for that... And that lower rent is not even often decisive. But the fact that you can rent housing in Woensel West outside the allocation system, instead of queuing for ten years, is an even much bigger argument. So then: yes, you can demand something in return if you offer people that opportunity." (Interview 3)

Controlled facilitation

Controlled facilitation is specific (physical) amenities (real estate) that match the local needs of residents and meet their needs, by providing social assistance or a particular service, related to the demographic group. Therefore, these amenities are matched by the housing corporation, varied in type, price segment and such factors that provide space for activities a service or product, local experts said:

"The neighbourhood workroom, a community centre for vulnerable residents (who experience livelihood security challenges) and organised by vulnerable residents. In this workroom, there's a standard consultation hour from the housing association, there's a consultation hour from 'Workplace Finance' (financial support organisation), there's in the course of GGZE (mental healthcare organisation) well, so that that varies enormously." (Interview 4)

The programme manager and area director also feel that by bringing back the solid base, a diverse offer is nowadays localised that meets these needs, and based on demographics:

"We have obviously made considerable improvements though, because when we started, that (the level of amenities) was not so... (good). There was just no school in this neighbourhood, which is back now" (Interview 3)

"We need to invest in youth, ensure that educational disadvantages are addressed and that those children get a lot of help and support in growing up in this neighbourhood and getting to a normal education." (Interview 3)

"We have a living room (community centre/ "neighbourhood workroom") for after-school care, I would say" (Interview 3)

"But then specifically for the target group with the greatest educational disadvantage sometimes with unsafe situations at home. So, we have a living room (the community centre) for that. So again, a lot of activities are organised in it (by organisations and volunteers)." (Interview 4)

"That's about language, maths, but that's also about culture, sports, exercise, dance theatre that's a whole palette of activities that children participate in. There are well over 100 children who are in those programmes. I believe there are 450 children (total in the neighbourhood)" (Interview 3)

"There was also no general practitioner post or health centre (in Woensel West), which is there now. There were a few sad shops but otherwise there was nothing for all the shopping. Then everyone had to go outside, outside the neighbourhood. Well, that amenity level has increased tremendously." (Interview 3)

"So, I know that Trudo, they did start that pretty quickly to get businesses, small-scale entrepreneurs, small businesses in there in Edisonstraat in the plinth. I also knew at the very beginning that that was quite a job, to get people (businesses) for that. And now there is a waiting list.'' (Interview 4)

"We have a cheap bakery, a cheap bicycle making a second-hand shop, there will be another supermarket" (Interview 3)

"There (in Woensel West) are cafeterias with four-euro coffee, but the normal man cannot afford that, but we also have yesterday's bread. In addition, we also have three places at least where you can have free coffee." (Interview 3)

"If you look at the businesses in the neighbourhood it is very defined and varied for several target groups. For example, the bakery, it's a bakery selling yesterday's bread for a small price. Well, that runs very well and in the afternoon they are sold out. Next to that, one of the entrepreneurs has a second-hand shop for children's clothes, so I think the amenity offer is good. Yes, in Woensel West is also definitely really an offer for the top segment (gentrifiers of the neighbourhood, who can spend more resources on goods and services), and are more expensive. But some amenities/ businesses are just a bit more specialised and therefore often

a bit higher with the price. I think for what it's worth, I do see that there is a good offer" (Interview 4)

"So for all groups there are... is the level of amenities (present and available). It's a very defined offer here in the neighbourhood. And then yes. Sometimes people then try to frame that into a certain corner, and if that is not justified, then I make decisions on that." (Interview 3)

Additional activities and needs

The demographic segments in this neighbourhood are categorised as follows, as the largest groups: the children, vulnerable residents (people who experience livelihood security challenges), students and gentrifiers. Among these demographic segments, there are also cultural differences. Because of these differences, there are many different bubbles among the residents, which makes mutual contact difficult, as they often interact with their bubble anyway, making them more likely to experience nuisance from other bubbles because they do not speak to each other enough to address certain subjects. This is also one of the reasons why activities or events are organised to make things easier to discuss and to reduce nuisance and improve the quality of life in that respect, in line with needs that become clear from participation. Various spaces are made available for this, such as public spaces, if necessary.

"In this neighbourhood, you can do a lot, and especially with the social polarisation, so everyone's own bubble. We just had the opening of the conclusion of this project, a theatre play, organised by a director. That. He had many, many conversations with people, approached 300 residents, took part in all these conversations and came to the following conclusion: his play was also called "The Island", "our island", because there are many subgroups, subcultures. (Interview 3)

"The residents' organisation that sits more pragmatically, by organising activities, huh, which is everything you can think of which just low threshold promotes a bit of social cohesion and just a piece of meeting. The moment people can meet and do fun things with each other, they must like… Let's put it this way; then of course that also makes it easier to discuss things that you that you don't like so much." (Interview 4)

"And we do that with the activities. We just had the neighbourhood Iftar. But despite the bad weather, as many as four, 500 people went. That was gigantic though. That's another one of those activities where we try to get all those people together, right, that they get to know each other" (Interview 3)

"And the yes, which is then also something at the sports director because we have at to get those students also well, yes, are of course all kinds of arrangements to get the students to land well in the neighbourhood and one of the things we did last summer; We built a, for example, a beach volleyball court." (Interview 4)

"And it yes, that was also something that was with the sports director, because we have...to get those students also well...., yes... There are of course all kinds of agreements to get the students to land well in the neighbourhood and one of the things we did last summer. And we

laid down a beach volleyball, for example. And we got lots of sand wheelbarrows and some equipment. And with that now comes a sports container as they call it. And it's a unit that can be expanded, Urban Sport, and there are already parties, including from outside the neighbourhood, who have expressed interest. Then, through a Booth-Camp, people get an explanation of how it works. Yes, so, 'Sport connects' hehe!" (Interview 4)

"... That is temporary (students), they are here. That's temporary housing." (Interview 4)

Looking at the need for other physical amenities within the 15-minute city, the neighbourhood appears to be very varied in its supply. As a result, the experts think that needs are well met, even though there is always a need for something, depending on, who you ask. What comes out of the participatory process, and from the interviews with these experts, is that there is a need for a supermarket by many in the neighbourhood and a drugstore The supermarket already present is not within the 15-minute walk radius for everyone in the neighbourhood, but it is 15 minutes cycling. On this basis, there will be a supermarket in the neighbourhood, although there is now the dissatisfaction about the type of supermarket, when it comes to the price segment and the supermarket in question (which is going to be there) is considered too expensive. This dissatisfaction comes mainly from the 'vulnerable resident' which is probably the largest demographic group in the neighbourhood. Indeed, the neighbourhood would benefit more from a cheaper supermarket. Because the supermarket that is going to be there now is too expensive, this group does not feel heard. The area director adds that a cheaper supermarket fits better in the Woensel West neighbourhood and that the current allocation is due to different interests of market players. This is evidenced by:

"If they can choose then, yes, something of drugstore or supermarket indeed, and then more for small groceries that you can get those. But anyway, on Edisonstraat you have a Turkish supermarket with fruit and vegetables. A lot of people also go there to do their shopping, AND you have the bakery. So there are both products nearby. Those are also two examples, where you can do your shopping cheaply." (Interview 4)

"Yes, I also know that they..., that they have those two points that I mentioned from one, from on the square, so those stickers (from a future supermarket) are on the windows on the square of the Spar, well, of course, there's comments here: "(that's a) way too expensive supermarket", "And why not...?" Anyway, it's just a small, tiny space. What I understood is that not all supermarkets were interested in it because it was limited to square metres. But that then comes back from the neighbourhood. Of "Why this choice?" and "That's way too expensive." (Interview 4)

"The image of Woensel West is then surely linked to Lidl supermarket or an Aldim and not to a Spar." (Interview 4)

Conclusion

It can be extracted from the interviews that the cooperation between the parties was of great importance in improving the neighbourhood, overall, within the framework of liveability. From participatory processes and liveability research, it emerged that safety, 'the basics' had to be good to

then place amenities controlled, attract certain demographic groups and volunteers to offer certain activities, all tailored to the needs of residents.

As a result of this collaboration and the different methods that are used, the neighbourhood has improved considerably and has a well-controlled offer that matches local amenities. Constant contact with residents constantly monitors where needs lie, and actions are taken based on this. Within the framework of the 15-minute city, the needs are well met according to experts. There is a waiting list of entrepreneurs who want to settle in Woensel West due to the pleasant business climate, whereas this was the opposite 20 years ago. Despite needs being well met by the varied supply, facilitating a drugstore and a suitable (relatively cheaper) supermarket would be pleasant for a large proportion of residents, which has become clear through participation.

Concluding, physical amenities often go together with social amenities and are therefore not always disconnected from each other, depending on the type of amenity in the neighbourhood. From these interviews, the presence of physical amenities offers a varied range of (social) services and products and relatively good allocation.

Recommendations
It could be argued that the physical amenities in the neighbourhood therefore contribute greatly to liveability, except for the supermarket and drugstore. Current residents are more likely to benefit from social amenities, help "behind the front door" and activities.

However, due to dissatisfaction in the area about the type of supermarket, research should be done to find out why the desired supermarket does not want to be located. This could provide more insight into what steps are needed as a municipality to still encourage the supermarket to establish itself and thereby meet the needs of the relevant demographic (target) group(s).

Discussion
The responsibility to facilitate amenities and activities in the neighbourhood, and participation of these by residents is not enforceable in some cases, as participation is often an individual choice.

Appendix 9: Survey results

Introduction

The survey conducted among the population of Woensel West resulted in 114 respondents in a four-week response period. As indicated, this survey is representative over the number of residents of Woensel West with an accuracy rate of 90% and a margin of error of 10%. The survey consisted of 11 questions, the results of which are presented below. As indicated in the survey guide, the survey consists of two parts, with the first part (questions one through four) of the survey asking for personal information and the second part asking about their satisfaction with the presence of supply within walking and cycling distance. They are then asked about the accessibility of the amenities within 15 minutes of walking and cycling distance. Additionally, it asks what amenities they would like to have within 15-minute walking and cycling distance. Finally, question 11 asks if there are any comments on this survey or topic. The personal information asked in the first part of the survey is important because based on these answers it is possible to classify respondents into demographic segments, and then draw conclusions from the differences or similarities between demographic groups concerning the answers of part two of the survey.

Data analysis

For the questions that deal with satisfaction (questions 5 and 6), respondents had the opportunity to choose from five options: 'not at all satisfied', 'not satisfied', 'satisfied', 'not at all satisfied' and 'not applicable/don't know'. For data analysis, we chose to contrast the results as 'satisfied' versus 'dissatisfied' for each amenity. This resulted in the responses 'completely satisfied' being generalised with 'satisfied' and 'completely dissatisfied' being generalised with 'dissatisfied'.

The results are basically generalised except for the questions that deal with accessibility (questions 7 and 8). Because the purpose of this survey is to measure accessibility by target demographic group, the results of these questions are analysed and compared more comprehensively by target group.

Question 1: "What is your age?"

The graph below shows that the largest group of respondents are between 30 and 39 years old and represented 36% of the total number of respondents, followed by the group of 19- and 29-year-olds (33%). These groups are also the largest groups of residents living in Woensel West. Indeed, 18.31% of Woensel West residents are between 20 and 29 years old and 16.41% of Woensel West residents are between 30 and 39 years old.

It can also be seen that some age groups did not respond to the survey, or significantly less concerning the age group of residents in the neighbourhood. Thereby, the distribution of respondents is relatively in line with the demographic age groups present and there is a relative spread, with the number of respondents averaging 2.16% per age group concerning the number of inhabitants of Woensel West. From this, it can be suggested that comparing these ages with each other is not representative. Thereby, looking at the spreadsheet of the results in Excel shows that the ages and satisfaction during the survey generally differ very much with the answers to all questions and that comparing ages concerning the answers does not give any additional insights.

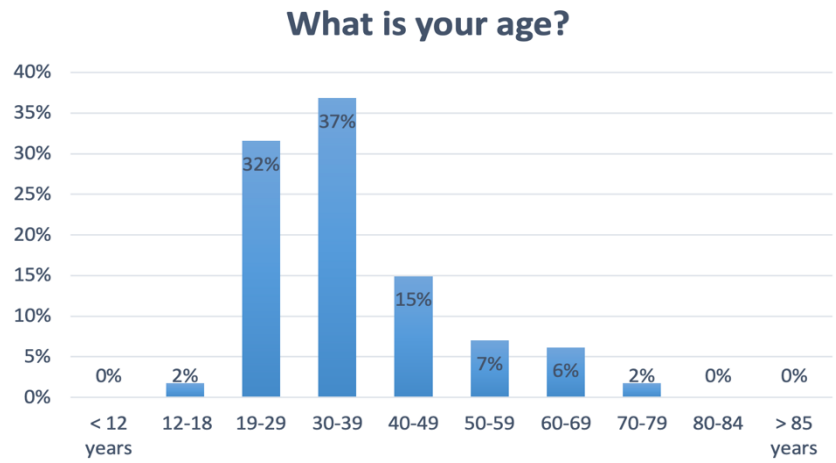


Image 33 Results question 1

Question 2: "How long have you lived in the neighbourhood?"

This question was asked to make relationships between how long residents have lived in Woensel West and satisfaction and accessibility.

Target groups	(n)	Percentage
1 - 2 years	58	51%
3 - 5 years	23	20%
6- 15 years	22	19%
15 years and over	11	10%
Total	**114**	**100%**

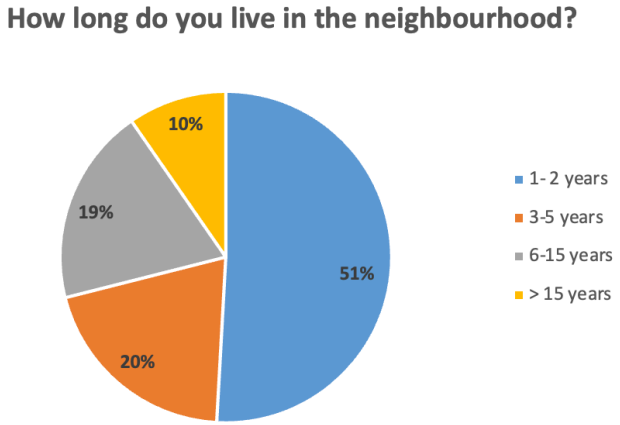


Image 34 Results question 2

Question 3: "Do you have children living at home?"

This question was asked because having children may cause people to respond differently to the questions asked during the survey. Primary schools may then be relatively more applicable than people who do not have children, for example, as policymaker 1 (2024) said. The shows that 71% of respondents do not have children living at home, relative to the 29% who do have children living at home.

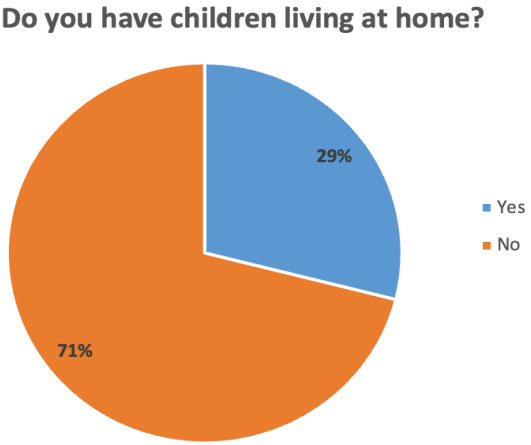


Image 35 Results question 3

Question 4: "What is your postal code?"

To know which part of Woensel West the respondents came from, the postal code was asked. The map below in *Image 36* clearly shows that respondents are spread across Woensel West with some concentrations around the postal codes

- 5621DA 18 x
- 5621DB 8 x
- 5621DE 5 x
- 5621CE 5 x
- 5621DZ 5 x

The first three postal codes are from the newly built part of Woensel West, of which 5621DA consists of private-sector housing, which is shown in *Image 36 as well*. The respondents and residents who are residents of private-sector housing are perceived as the gentrifying target group due to their relatively higher estimated income. These are 41 in total and represent 36% of the respondents and live mainly in the north of Woensel West. Those who have one of the following postal codes fall under this target group: 5621 DA, DB, GA, CP, GC, CT, CR, CN, GR, GE, GD, GW, EC, ES, CK, EA, JD, EE, JC, AJ, AP, AN, AM, AL, AK, AG, JB, HB, BA, ET, BX, 25% of respondents from DB, 20% from DE and 50% from DD. This was found out through the map shown in Image 37. The coloured areas on the map are homes owned by social housing corporations. The uncoloured areas fall under private-sector housing. The private-sector housing is also marked with red circles.

The respondents who fell under 5621JG (in the Northeastern part of the study area) are students who are temporarily housed in a building until new housing is built on this site in the coming years. These are a total of 3 and represented 3% of the total respondents.

Respondents and occupants of social housing are seen as the 'vulnerable' target group within this study because of their relatively lower income. It should be noted that the percentage/number of tenants living in rented accommodation has not been included because the data for this is lacking. In total, this concerns 73 respondents representing 64%.

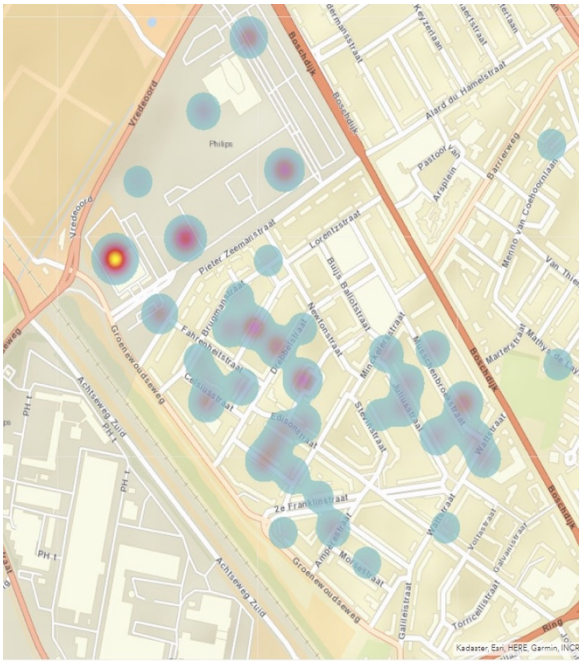


Image 36 overview distribution of responders/residents Woensel West (Geoweb, 2024; ARCgis, 2024)

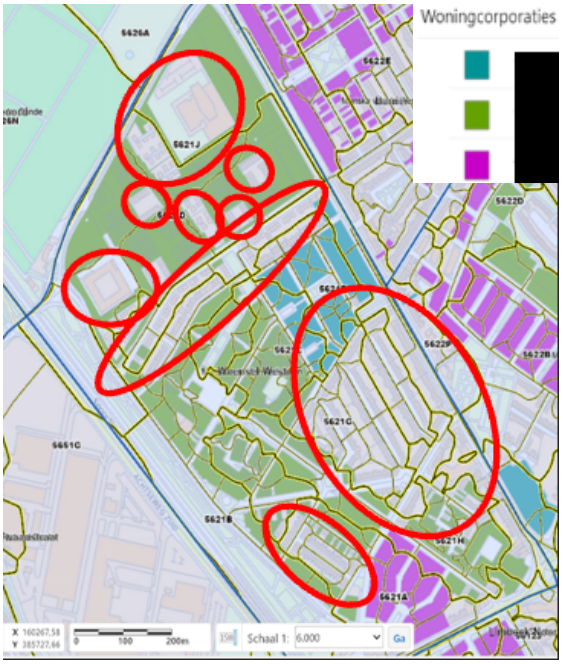


Image 37 the postal codes map, marked with private-sector housing in the circles and social housing in the

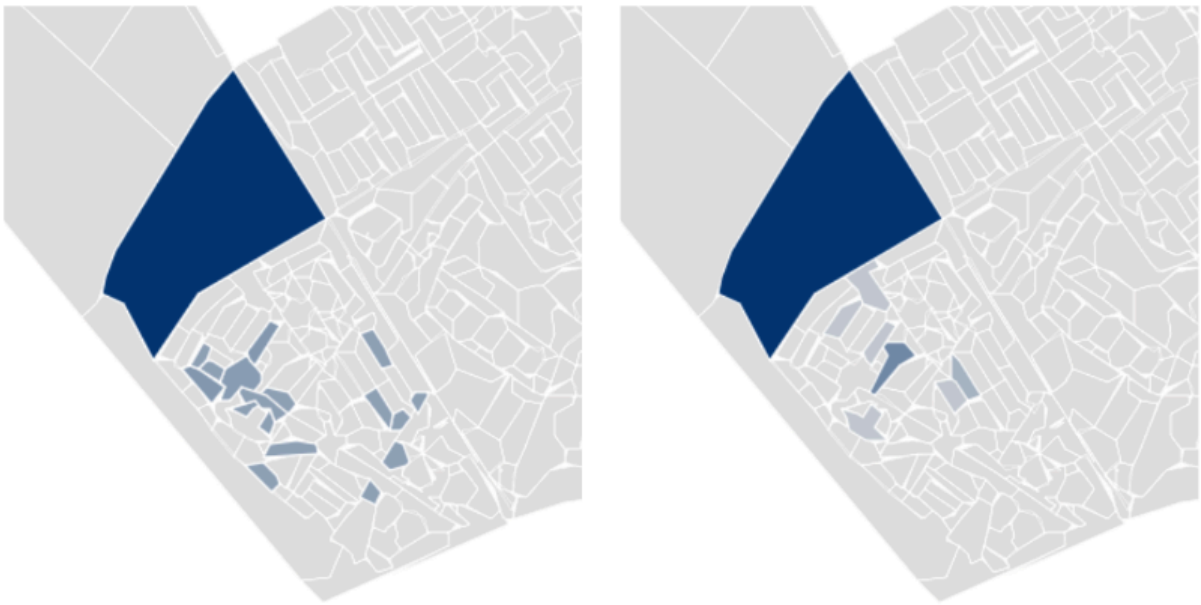


Image 38 Respondents distributed to target groups (1-2 years, and 3-5 years) about Woensel West

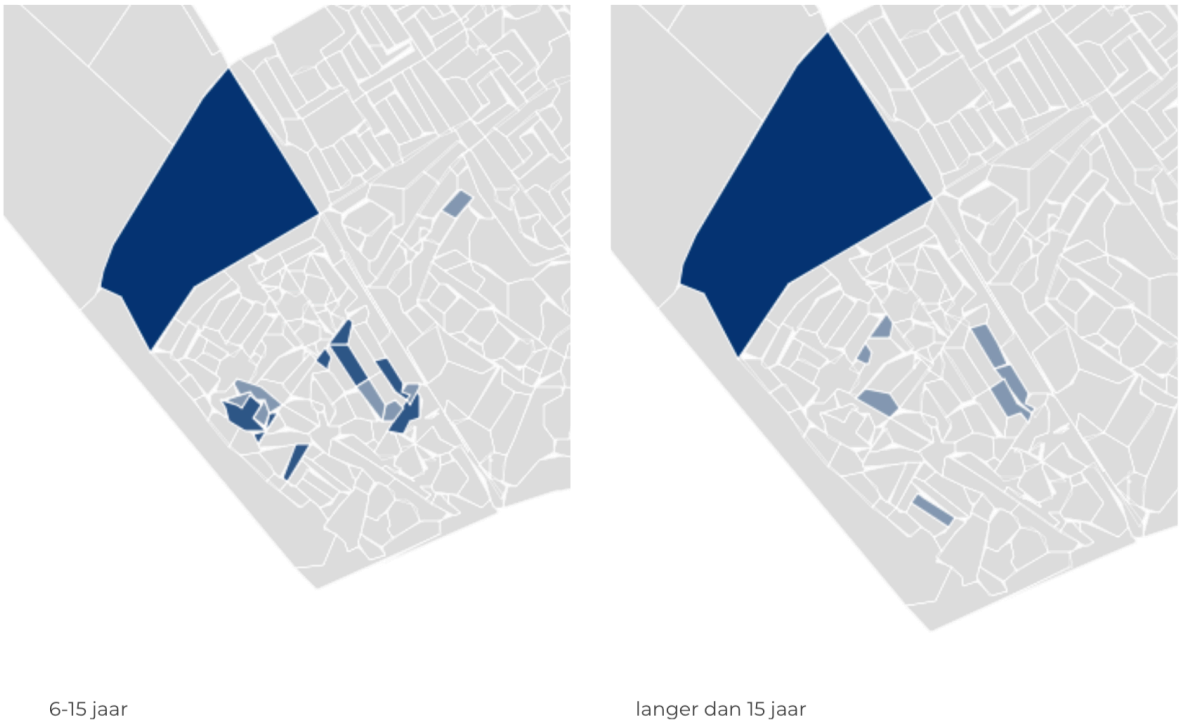


Image 39 Respondents distributed to target groups (6-15 years, and 15 years and longer) about Woensel West

Target groups

The results of questions two and four make it possible to make target groups of how long respondents live in the neighbourhood, and how large these groups are. In addition, these questions make it possible to see who lives in private-sector housing in Woensel West and who lives in social housing.

Target groups	(n)	Percentage
Living in social housing	73	64%
Living in free sector housing	41	36%

Question 5 "now follows some statements about your satisfaction with the presence of amenities, which are within a 15-minute walk of your home. For each statement, please indicate the extent to which you are satisfied with the presence of the amenity."

This question was asked to see the level of satisfaction with the presence of supply. For this question, respondents were able to choose from five options: 'satisfied, 'completely satisfied,' 'not satisfied,' and 'not at all satisfied.' There was also an option of 'don't know/not applicable'.

Table 42 Ranking of satisfaction over the presence of amenities within walking distance

Amenity type	Satisfactory	Not applicable/ don't know
Green spaces	92%	0%
The general supply of amenities	74%	1%
Amenities for social meetings	73%	7%
Healthcare offer	66%	17%
Speciality shops	60%	4%
Sports amenities	55%	13%
Playgrounds	51%	30%
Bus stops	48%	14%
Primary schools	44%	47%
Childcare locations	36%	57%
Supermarkets	33%	1%
Secondary schools	20%	66%

Conclusion

From all the results, a ranking was created and shown in *Table 42.* Here it can be seen where people are most satisfied with attendance and dissatisfied. Looking at the results, it is that several amenities stand out in which there is a high satisfaction and high applicability of the amenity type among all respondents. Such as green spaces, the general supply of amenities, and amenities for social meetings and the healthcare offer. However, the amenities that are lower on the ranking, have a lower satisfaction, such as supermarkets, speciality shops, sports amenities, and bus stops.

This is reinforced in column three, where satisfaction and dissatisfaction are calculated for the groups where these amenities apply. Green spaces rank first with the highest satisfaction followed by primary schools. A particular insight is that primary school scores are relatively low in column two, as a high proportion of the population filled in "not applicable/don't know," but for those who did not fill this out, there is a high satisfaction presence of this. Again, there is a relatively high satisfaction for 'opportunities for social meetings'. In addition, the relatively low satisfaction of sports amenities, speciality shops, playgrounds, secondary schools, bus stops and the supermarket at the bottom.

Table 43 Ranking list by satisfaction, dissatisfaction and applicability of the present amenities within a 15-minute walk

Satisfaction overall	**Dissatisfaction total**	**Distribution of amenities by satisfaction 15-minute walking distance over attendance excluding "not applicable/ don't know" responses**
Green spaces (92%)	Supermarket (66%)	Green spaces (92%)
The general allocation of amenities (74%)	Bus stops (39%)	Primary schools (86%)
Opportunity for social gathering, through cafes, restaurants, community centres and youth centres (74%)	Speciality stores (37%)	Childcare locations (84%)
Healthcare offer (66%)	Sports amenities (36%)	Opportunity for social gathering, through cafes, restaurants, community centres and youth centres (80%)
Speciality stores (60%)	Playgrounds (32%)	Care allocation such as doctor (79%)
Sports amenities (55%)	The general allocation of amenities (23%)	Satisfaction with general presence of amenities (77%)
Playgrounds (51%)	Healthcare offer (18%)	Sports amenities (65%)
Bus stops (48%)	Secondary schools (14%)	Speciality stores (62%)
Primary school (44%)	Childcare locations (7%)	Playgrounds (62%)
Childcare locations (36%)	Primary school (7%)	Secondary schools (59%)
Secondary schools (20%)	Opportunity for social gathering, through cafes, restaurants, community centres and youth centres (19%)	Bus stops (56%)
Supermarket (33%)	Green spaces (8%)	Supermarket (33%)

Question 6: Next are some statements about your satisfaction with the presence of amenities that are within 15 minutes of cycling of your home. For each statement, please indicate the extent to which you are satisfied with the amenity.

Question 6 is the same as question 5, however, it now asks for satisfaction with the presence of amenities within a 15-minute cycling distance. This produced the following results:

Table 44 Ranking of satisfaction over the presence of amenities within 15 minutes cycling distance

Amenity type	Satisfactory	Not applicable/ don't know
Green spaces	94%	1%
General offer of amenities	88%	4%
Amenities for social meetings	85%	6%
Speciality shops	83%	2%
Bus stops	79%	17%
Healthcare offer	78%	13%
Sports amenities	74%	10%
Supermarkets	70%	2%
Playgrounds	57%	31%
Primary schools	45%	52%
Childcare locations	41%	54%
Secondary schools	31%	61%

Conclusion

Table 45 below, shows the survey results from *Table 44* above, schematically, ordered from high to low by column. The first column shows satisfaction, the second column shows dissatisfaction, and the third column shows satisfaction by amenity for the groups which these amenities apply to.

Overall, there is high satisfaction with most amenities and low dissatisfaction on average. Looking at column one, the highest satisfaction is for green spaces, relatively, followed by speciality shops, general amenities, sports amenities, and supermarkets. Followed by lower satisfaction with playgrounds, primary schools, childcare sites, and secondary schools. In column two, the highest dissatisfaction is about the supermarket, the general amenity offers, speciality shops, sports amenities, bus stops, the healthcare offer, and playgrounds. However, as we look at the third column, we see that the highest satisfaction is about the green spaces, the primary schools, the general amenities offered, childcare sites, an opportunity for social meetings, healthcare offers, speciality shops, sports

amenities, and playgrounds. As we look at all columns the relative highest dissatisfaction is about the supermarkets, secondary schools, bus stops, sports amenities, and speciality shops.

Table 45 Ranking list by satisfaction of attendance within 15 minutes of walking

Satisfaction overall	**Dissatisfaction total**	**Distribution of amenities by satisfaction 15-minute walking distance over attendance excluding "not applicable/ don't know" responses**
Green spaces (94%)	Supermarket (28%)	Green spaces (94%)
Opportunity for social gathering, through cafes, restaurants, community centres and youth centres (85%)	The general allocation of amenities (23%)	Primary schools (93%)
Speciality stores (84%)	Speciality stores (16%)	Satisfaction with general presence of amenities (92%)
Healthcare offer (78%)	Sports amenities (16%)	Childcare sites (91%)
The general allocation of amenities (74%)	Bus stops (14%)	Opportunity for social meetings, through cafes, restaurants, community centres and youth centres (90.3%)
Sports amenities (74%)	Healthcare offer (13%)	Care allocation such as doctor (85%)
Supermarket (70%)	Playgrounds (12%)	Speciality shops (84)
Bus stops (69%)	Secondary schools (9%)	Sports amenities (82%)
Playgrounds (57%)	Opportunity for social gathering, through cafes, restaurants, community centres and youth centres (9%)	Playgrounds (82%)
Primary school (45%)	Green spaces (5%)	Bus stops (83%)
Childcare locations (41%)	Childcare locations (4%)	Secondary schools (78%)
Secondary schools (31%)	Primary school (4%)	Supermarket (71%)

Comparison of the results from walking and cycling

As we compare the results from satisfactory within walking distance and cycling distance, there are big differences. Looking at column 1, the biggest differences can be seen in speciality shops, sports amenities, secondary education, opportunities for social meetings and the healthcare offer. Relative satisfaction has increased everywhere when we look at the percentages within cycling distance. A cause consequence of this is that the dissatisfaction in column two thereby decreased everywhere relatively (and relatively often halved) about the offer within cycling distance.

In column two, relatively the largest differences can be seen at supermarkets, bus stops, speciality shops, sports amenities, and playgrounds. Column three shows that the amenities that apply to certain target groups, and that satisfaction with the offer within cycling distance also increased significantly.

Table 46 Satisfaction per amenity overall respondents

Satisfactory total (walking/ cycling)	**dissatisfactory total (walking/ cycling)**	**Distribution of amenities by satisfaction 15-minutes about attendance without the answers "not applicable/ don't know" (walking/ cycling)**
Green spaces (92%/ 94%)	Supermarket (66%/ 28%)	Green spaces (92%/ 94%)
Opportunity for social meeting, through cafes, restaurants, community centres and youth centres (74%/ 85%)	The general amenity offerings (23%/ 23%)	Primary schools (86%/ 93%)
Speciality shops (60%/ 83%)	Speciality shops (37%/ 16%)	The general amenity offerings (77%/ 92%)
Healthcare offering (66%/ 78%)	Sports amenities (36%/ 16%)	Childcare sites (84%/ 90%)
The general amenity offerings (74%/ 74%)	Bus stops (38.6%/ 14%)	Opportunity for social meeting, through cafes, restaurants, community centres and youth centres (80%/ 90%)
Sports amenities (55%/ 74%)	Healthcare offering (18%/ 13%)	Healthcare offering (79%/ 85%)
Supermarket (33%/ 70%)	Playgrounds (32%/ 12%)	Speciality shops (62%/ 84%)
Bus stops (48%/ 69%)	Secondary schools (14%/ 9%)	Sports amenities (65%/ 82%)
Playgrounds (51%/ 57%)	Opportunity for social meeting, through cafes, restaurants, community centres and youth centres (19%/ 9%)	Playgrounds (62%/ 82%)
Primary schools (44/ 45%)	Green spaces (8%/ 5%)	Bus stops (56%/ 83%)
Childcare sites (36%/ 41%).	Childcare sites (7%/ 4%)	Secondary schools (59%/ 78%).
Secondary schools (20%/ 31%)	Primary schools (7%/ 4%)	Supermarket (33%/ 71%)

Question 7: "Now follows some statements about the ability to use the amenities that are within a 15-minute walk of your home. Can you use the following amenities, or are they full? For each statement, please indicate the extent to which you can use the amenity."

This question was asked to measure the accessibility of the amenities within 15 minutes of walking distance. This asked whether it is possible to use the amenities and respondents had three response options: 'yes', 'no', and 'not applicable, don't know'.

Below, the questions are first approached in general, and then the results by target group are addressed. The conclusion of this question compares the results overall and by the target group. The reason that some categories are shown here, rather than all amenity types, is because, with the amenities shown, there may be a limit on the number of people who can use them and may have a membership freeze, for example. This is not the case with restaurants cafes and parks. In addition, the length of the survey would become so long if all amenities were included, so it was chosen to keep this question short based on relevance, but also to keep the response rate relatively high.

In general

Table 47 general accessibility of the amenities within walking distance (all respondents together)

Amenity type	Accessible	Inaccessible	Not applicable	Accessibility results without results: 'not applicable/ don't know'
Sports amenities	47%	22%	31%	68%
Amenities for social meeting	82%	7%	11%	82%
Healthcare amenities	63%	18%	18%	77%
Childcare sites	25%	33%	64%	67%
Primary schools	31%	4%	65%	87%
Secondary schools	15%	11%	75%	59%

Accessibility per target group duration of living in Woensel West

Table 48 Accessibility of sports amenities within walking distance

Target group	Size of target group (n)	Accessible	Inaccessible
1-2 years	58	48%	19%
3-5 years	23	48%	17%
6-15 years	22	50%	32%
15 years and longer	11	36%	18%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target group * accessibility sportvoorzieningen wandelafstand	79	69.3%	35	30.7%	114	100.0%

target group * accessibility sportvoorzieningen wandelafstand Crosstabulation

Count

		accessibility sportvoorzieningen wandelafstand		
		yes	no	Total
target group	1-2 years	27	13	40
	3-5 years	13	5	18
	6-15 years	10	5	15
	15 years and longer	4	2	6
Total		54	25	79

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.166[a]	3	.983
Likelihood Ratio	.168	3	.983
N of Valid Cases	79		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.90.

Image 40 Output Crosstabs Chi-Square Tests (SPSS)

Pearson's chi-square test was conducted to investigate whether there is a relationship between the length of time someone lives in Woensel West and the accessibility of sports amenities within walking distance, excluding responses 'not applicable'. Of the 114 responses, 79 were valid (69.3%), and 35 were missing (30.7%). The results show no significant relationship between the two variables, $\chi 2$ (3, N = 79) = .166, p = .983. The Likelihood Ratio test supported this finding, $\chi 2$ (3, N = 79) = 0.168, p = 0.983.

Based on the findings of this study, we can conclude that accessibility to sports amenities within walking distance is evenly distributed among the different target groups. This result shows that duration that someone lives in Woensel West is not a determining factor for the accessibility of these amenities and H0 cannot be rejected.

The percentage of cells with an expected frequency of less than 5 was 37.5%, with the minimum expected frequency being 1.90. These low expected frequencies may affect the reliability of Pearson's chi-square test results because one of the assumptions of the test was not fully met. As a result, there is insufficient evidence to reject H0.

Table 49 Accessibility of sports amenities between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*46%*	*24%*
Social housing	*73*	*47%*	*16%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * sports amenties walking	79	69.3%	35	30.7%	114	100.0%

ID * sports amenties walking Crosstabulation

Count

		sports amenties walking		
		yes	no	Total
ID	private sector house	19	11	30
	social rent	35	14	49
Total		54	25	79

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.564[a]	1	.453		
Continuity Correction[b]	.252	1	.616		
Likelihood Ratio	.559	1	.455		
Fisher's Exact Test				.467	.306
N of Valid Cases	79				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.49.

b. Computed only for a 2x2 table

Image 41 Output Crosstabs Chi-Square Tests (SPSS) social rent private sector accessibility sports amenities within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between residents living in the type of housing (private sector and social rent) and the accessibility of sports amenities available within walking distance. The test results showed that there was no significant relationship between these variables, χ 2 (1) = 0.564, p = 0.453p = 0.453. The continuity correction for the Chi-square test gave a similar non-significant result, χ2 (1) = 0.252, p = 0.616. The likelihood ratio test supported this finding, χ2 (1) = 0.559, p = 0.455. Thereby, Fisher's exact test confirmed the non-significant result with a 1-sided p-value of 0.467.

Based on the findings of this study, we can conclude that accessibility to sports amenities is evenly distributed among the target groups. This result shows that people living in social rented housing in Woensel West is not a determinant of accessibility to these amenities and H0 cannot be rejected. Finally, there were no problems with the expected frequencies; the minimum expected frequency was 9.49 and none of the cells had an expected frequency smaller than 5.

Results for amenities for social meetings (hospitality) per target group

Table 50 Accessibility of amenities for social meetings (hospitality) within walking distance

Within 15-minutes of walking distance per target group

Target group	Size of target group (n)	Accessible	Inaccessible
1-2 years	58	86%	5%
3-5 years	23	91%	4%
6-15 years	22	86%	5%
15 years and longer	11	100%	0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * Accessibility amenities for social meetings	101	88.6%	13	11.4%	114	100.0%

target groups * Accessibility amenities for social meetings Crosstabulation

Count

		Accessibility amenities for social meetings		
		yes	no	Total
target groups	1-2 years	42	6	48
	3-5 years	21	1	22
	6-15 years	19	1	20
	15 years and over	11	0	11
Total		93	8	101

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.904[a]	3	.407
Likelihood Ratio	3.673	3	.299
N of Valid Cases	101		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .87.

Image 42 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration) and accessibility amenities social meetings within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between the length of time someone lives in Woensel West and the accessibility of the amenities for social meetings within walking distance, excluding responses 'not applicable'. Of the 114 cases, 101 were valid (88.6%) and 13 were missing (11.4%).

The results show that there is no statistically significant relationship between target groups and accessibility to amenities for social meetings (χ^2 (3) = 2.904, p = .407). This shows that the presence of accessibility does not differ significantly between the different target groups. This is supported by the Likelihood Ratio: χ^2 (3) = 3.673, p = .299. Based on the findings of this study, we can conclude that accessibility to social gatherings is evenly distributed among the different target groups. This result shows that the duration that someone lives in Woensel West is not a determining factor for the accessibility of these amenities and H0 cannot be rejected.

However, it should be noted that 50% of the cells have an expected frequency of less than 5, which may indicate the limited power of the test. This may affect the robustness of the conclusions, and future studies with a larger sample size may be needed to confirm these findings. As a result, there is insufficient evidence to reject H0.

Table 51 Accessibility of amenities for social meetings (hospitality) between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*71%*	*10%*
Social housing	*73*	*88%*	*6%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * social meeting walking	101	88.6%	13	11.4%	114	100.0%

ID * social meeting walking Crosstabulation

Count

		social meeting walking		
		yes	no	Total
ID	private sector house	29	4	33
	social rent	64	4	68
Total		93	8	101

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.186[a]	1	.276		
Continuity Correction[b]	.485	1	.486		
Likelihood Ratio	1.118	1	.290		
Fisher's Exact Test				.433	.238
N of Valid Cases	101				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.61.

b. Computed only for a 2x2 table

Image 43 Output Crosstabs Chi-Square Tests (SPSS) social rent private sector and the accessibility of amenities social meetings within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between residents living in the type of housing (private sector and social rent) and the accessibility of the amenities for social meetings within walking distance. This did not include responses: 'not applicable' and resulted in 101 valid (88.6%) and 13 missing (11.4%) out of 114 cases.

Test results showed that there is no statistically significant relationship between housing type and accessibility of the amenities for social gathering: (χ^2 (1) = 1.186, p = .276). The p-value is greater than the usual significance level of .05, meaning that the variance of accessibility of this amenity does not depend on the type of housing types of respondents live in. The distribution of accessibility does not differ significantly between the two housing types.

However, 25% shows that the expected count is less than 5, with an expected count minimum of 2.61. this does not adhere to chi-square assumptions, which affects the reliability of the test. As a result, there is insufficient evidence to reject H0.

Results of healthcare amenities per target group

Table 52 Accessibility of healthcare amenities within walking distance

Within 15-minutes of walking distance

Target group	Size of target group (n)	Accessible	Inaccessible
1-2 years	58	52%	22%
3-5 years	23	74%	17%
6-15 years	22	82%	9%
15 years and longer	11	73%	9%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility healthcare offer	92	80.7%	22	19.3%	114	100.0%

target groups * accessibility healthcare offer Crosstabulation

Count

		accessibility healthcare offer		
		yes	no	Total
target groups	1-2 years	30	13	43
	3-5 years	16	5	21
	6-15 years	17	2	19
	15 years and longer	8	1	9
Total		71	21	92

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.683[a]	3	.298
Likelihood Ratio	4.017	3	.260
N of Valid Cases	92		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.05.

Image 44 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration) and the accessibility of healthcare within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between the length of time someone lives in Woensel West and the accessibility of healthcare within walking distance, excluding responses 'not applicable'. This resulted in 92 valid responses (80.7%), as 22 were missing (19.3%).

The results from the Pearson Chi-square test show that there is no statistically significant association between the age groups and accessibility of accessible healthcare (χ^2 (3) = 3.683, p = .298). The p-value is greater than the usual significance level of .05, meaning that the variation in accessibility to

healthcare does not differ significantly between different target groups and the length of time someone has lived in Woensel West.

However, 37.5% have an expected frequency of less than 5, with a minimum expected value of 2.05. This may affect the reliability of the Chi-square test, resulting in insufficient evidence to reject H0.

Table 53 Accessibility of healthcare amenities between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*61%*	*17%*
Social housing	*73*	*60%*	*15%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * healthcare walking	93	81.6%	21	18.4%	114	100.0%

ID * healthcare walking Crosstabulation

Count

		healthcare walking		
		yes	no	Total
ID	private sector house	25	9	34
	social rent	47	12	59
Total		72	21	93

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.464[a]	1	.496		
Continuity Correction[b]	.179	1	.672		
Likelihood Ratio	.457	1	.499		
Fisher's Exact Test				.608	.332
N of Valid Cases	93				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.68.

b. Computed only for a 2x2 table

Image 45 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector – social rent) and accessibility healthcare within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between residents living in the type of housing (private sector and social rent) and the accessibility of the available supply of amenities for social meetings within walking distance. This excluded responses: 'not applicable' and resulted in 93 valid (81.6%) and 13 missing (18.4%) out of 114 cases.

The test results showed that there was no statistically significant relationship between housing type and accessibility of health care within walking distance: (χ^2 (1) = 0.464, p = .496). The p-value is greater than the significance level of .05, meaning that the variation in healthcare accessibility is not significantly different between residents of different housing types. This ensures that hypothesis H0

cannot be rejected. In this case, there are no cells with an expected frequency of less than 5, which improves the reliability of the Chi-square test.

Results of childcare locations by target group

Table 54 Accessibility of childcare locations within walking distance

Within 15-minutes of walking distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*22%*	*7%*
3-5 years	*23*	*13%*	*22%*
6-15 years	*22*	*36%*	*18%*
15 years and longer	*11*	*27%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility childcare sites	42	36.8%	72	63.2%	114	100.0%

target groups * accessibility childcare sites Crosstabulation

Count

		accessibility childcare sites		
		yes	no	Total
target groups	1-2 years	14	5	19
	3-5 years	3	5	8
	6-15 years	8	4	12
	15 years and over	3	0	3
Total		28	14	42

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.984[a]	3	.173
Likelihood Ratio	5.705	3	.127
N of Valid Cases	42		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.00.

Image 46 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility childcare locations within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between residents living in the type of housing (private sector and social rent) and the accessibility of the available supply of amenities for social meetings within walking distance. This excluded responses: 'not applicable' and resulted in 93 valid (81.6%) and 13 missing (18.4%) out of 114 cases.

The test results showed that there was no statistically significant relationship between housing type and accessibility of health care within walking distance: (χ^2 (1) = 0.464, p = .496). The p-value is greater than the significance level of .05, meaning that the variation in healthcare accessibility is not significantly different between residents of different housing types. This ensures that hypothesis H0 cannot be rejected. In this case, there are no cells with an expected frequency of less than 5, which improves the reliability of the Chi-square test.

Table 55 Accessibility of childcare locations between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*20%*	*22%*
Social housing	*73*	*25%*	*7%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * childcare locations walking	41	36.0%	73	64.0%	114	100.0%

ID * childcare locations walking Crosstabulation

Count

		childcare locations walking		
		yes	no	Total
ID	private sector house	8	8	16
	social rent	20	5	25
Total		28	13	41

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.055[a]	1	.044		
Continuity Correction[b]	2.788	1	.095		
Likelihood Ratio	4.020	1	.045		
Fisher's Exact Test				.084	.048
N of Valid Cases	41				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.07.

b. Computed only for a 2x2 table

Image 47 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector – social rent) and accessibility childcare locations within walking distance

The Pearson Chi-square shows that there is a statistically significant relationship between housing type and accessibility of childcare locations. (χ^2 (1) = 4.055, p = .044). The p-value is smaller than the usual significance level of .05, implying that the variation in the ability to walk to childcare locations differs significantly across housing types.

The distribution of this ability differs significantly between the two housing types, with residents of social rent houses having more access to childcare locations than residents of private sector housing.

In this case, there are no cells with an expected frequency of less than 5, which strengthens the power of the Chi-square test. On this basis, H0 can be rejected when it comes to childcare locations within walking distance.

Results of primary schools by target group

Table 56 Accessibility of primary schools within walking distance

Within 15-minutes of walking distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*28%*	*5%*
3-5 years	*23*	*22%*	*0%*
6-15 years	*22*	*45%*	*10%*
15 years and longer	*11*	*36%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility primary schools	40	35.1%	74	64.9%	114	100.0%

target groups * accessibility primary schools Crosstabulation

Count

		accessibility primary schools		
		yes	no	Total
target groups	1-2 years	16	3	19
	3-5 years	5	0	5
	6-15 years	10	2	12
	15 years and over	4	0	4
Total		35	5	40

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.664[a]	3	.645
Likelihood Ratio	2.754	3	.431
N of Valid Cases	40		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .50.

Image 48 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility primary schools within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between the length of time someone lives in Woensel West and the accessibility of primary schools within walking distance, excluding responses 'not applicable'. This resulted in 40 valid responses (35.1.%), as 74 were missing (64.9%).

The results from the Pearson Chi-square test show that there is no statistically significant relationship between the age groups and the accessibility of primary schools within walking distance. The distribution of accessibility of these primary schools does not differ significantly between the target groups by degree of how long they live in Woensel West.

However, of six cells, 75% have an expected frequency of less than 5, with a minimum expected value of 0.50. This may affect the robustness of the Chi-square test. Based on these results, there is insufficient evidence to reject H0. A future study with a larger sample could be beneficial to confirm these results.

Table 57 Accessibility primary schools within walking distance between housing type

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*17%*	*10%*
Social housing*	*73*	*37%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * primary schools walking	40	35.1%	74	64.9%	114	100.0%

ID * primary schools walking Crosstabulation

Count

		primary schools walking		
		yes	no	Total
ID	private sector house	8	4	12
	social rent	27	1	28
Total		35	5	40

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.803[a]	1	.009		
Continuity Correction[b]	4.354	1	.037		
Likelihood Ratio	6.237	1	.013		
Fisher's Exact Test				.022	.022
N of Valid Cases	40				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.50.

b. Computed only for a 2x2 table

Image 49 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector– social rent) and accessibility primary schools within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between the house type someone lives in and the accessibility of primary schools within walking distance, excluding responses 'not applicable'. This resulted in 40 valid responses (35.1%), as 74 were missing (64.9%).

Pearson Chi-square test shows that there is a statistically significant relationship between the housing type and the accessibility of primary schools within walking distance (χ^2 (1) = 6.803, p = .009). The p-value is smaller than the usual significance level of .05, meaning that the variation the accessibility of primary schools is significantly different between residents living in the different housing types. Here, there is evidence that residents living in social rented housing experience more accessibility to childcare locations within walking distance. Due to this present significance, H0 should be rejected for the accessibility comparison between residents of social rented and private sector housing for childcare locations within walking distance.

However, two cells (50%) have an expected frequency of less than 5, with a minimum expected value of 1.50. This may affect the robustness of the Chi-square test, but the significance remains present.

Results of secondary schools by target group

Table 58 Accessibility of secondary schools within walking distance

Within 15-minutes of walking distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*19%*	*5%*
3-5 years	*23*	*13%*	*13%*
6-15 years	*22*	*14%*	*18%*
15 years and longer	*11*	*36%*	*18%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility secondary schools	29	25.4%	85	74.6%	114	100.0%

target groups * accessibility secondary schools Crosstabulation

Count

		accessibility secondary schools		
		yes	no	Total
target groups	1-2 years	10	3	13
	3-5 years	4	2	6
	6-15 years	3	4	7
	15 years and over	1	2	3
Total		18	11	29

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.422[a]	3	.331
Likelihood Ratio	3.433	3	.330
N of Valid Cases	29		

a. 7 cells (87.5%) have expected count less than 5. The minimum expected count is 1.14.

Image 50 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility secondary schools within walking distance

A Chi-square test was conducted to investigate whether there is a significant relationship between the length of time people live in Woensel West and the accessibility of secondary schools within walking distance. Out of 114 cases, 29 were valid (25.4%) and 85 were missing (74.6%).

The results of Pearsons' Chi-square test show that there is no statistically significant relationship between the duration that people live in Woensel West and the accessibility of secondary schools within walking distance. Hence, the duration that people live in Woensel West is not a determinant of the accessibility of secondary schools. As a result, H0 cannot be rejected.

However, a note should be made that 87.5% of the cells have an expected frequency of less than 5 and a minimum expected value of 1.14. With this, there is limited power of the test and affects the reliability of the conclusion. Thus, there is insufficient evidence to reject H0. Future studies with larger sample sizes may be needed to confirm these findings.

Table 59 Accessibility of secondary schools between private sector housing and social housing within walking distance

Within 15-minutes of walking distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*15%*	*15%*
Social housing*	*73*	*19%*	*8%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * secondary schools walking	29	25.4%	85	74.6%	114	100.0%

ID * secondary schools walking Crosstabulation

Count

		secondary schools walking		
		yes	no	Total
ID	private sector house	3	6	9
	social rent	14	6	20
Total		17	12	29

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.440[a]	1	.064		
Continuity Correction[b]	2.095	1	.148		
Likelihood Ratio	3.444	1	.063		
Fisher's Exact Test				.106	.074
N of Valid Cases	29				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.72.

b. Computed only for a 2x2 table

Image 51 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector – social rent) and accessibility primary schools within walking distance

Pearson's chi-square test was conducted to investigate whether there is a relationship between the house type someone lives in and the accessibility of secondary schools within walking distance, excluding responses 'not applicable'. This resulted in 29 valid responses, as 85 were missing.

From the results of the Chi-square test, there is no statistically significant difference between the housing type and the accessibility of secondary schools within walking distance at a significance level of .05. Although the p-value is near the limit. This implies that there is a trend suggesting that residents of socially rented housing may experience more accessibility to secondary schools, than people living in private-sector housing. Nevertheless, the result is not significant, so there is no significant difference between residents of specific housing types and accessibility to secondary schools. In addition, it should be noted that 1 cell (25%) has an expected frequency of less than 5, with a minimum expected value of 3.72. This may affect the robustness of the Chi-square test. In addition, the sample size is questionable due to the high number of missing data (74.6%), which may negatively affect reliability. Based on these results, it is not possible to statistically reject H0a, but also because the results do not meet the assumptions of the Chi-squared test.

Conclusion Question 7

Table 60 Conclusion of availability of amenities in general within 15-minutes of walking distance overall respondents together (Own work)

Accessibility	Inaccessibility	Without data "Not applicable"
Social encounter (82%)	Sports amenities (22%)	Social meeting (92%)
Healthcare offer (63%)	Healthcare offer (18%)	Primary schools (87%)
Sports amenities (47%)	Childcare locations (13%)	Healthcare offer (77%)
Primary schools (31%)	Secondary schools (11%)	Sports amenities (68%)
Childcare locations (25%)	Social encounter (7%)	Childcare locations (67%)
Secondary schools (15%)	Primary schools (4%)	Secondary schools (59%)

What can be seen in *Table 61* is the overall accessibility across all respondents in order from high to low by column. The first column shows the accessibility for the respective amenity category (walking/cycling). The second column shows the inaccessibility by category. The third column shows the results where the answers "not applicable/don't know" are not included and the accessibility is shown for the target groups for which these amenities do apply. These results are from those who think they know the accessibility of these amenities and/or where this applies to them.

For some amenities, a relatively high proportion of respondents indicated that these amenities are inaccessible, and it is not possible to use them. In the table, this concerns the following amenities that are present within a 15-minute walk: the secondary schools, where 59% indicated that they can use this facility, as opposed to the 41% who cannot. The same is true for childcare locations where 67% of respondents indicated they could use it, as opposed to 33% who did not. This is also true for healthcare amenities with 77% accessibility and sports amenities, where "only" 68% can use the amenities within walking distance.

Accessibility towards target groups as they live longer in Woensel west

Looking at the results per target group, it can be seen from the Chi-square tests, that there are no statistically significant differences when looking at the length of time someone lives in Woensel West and accessibility to: sports amenities, amenities for social meeting, healthcare, childcare locations, primary schools and secondary schools within walking distance. This is supported by the results, with the results scoring well above the p-value. However, since the assumptions of the Chi-square test are violated, in that for these amenities more than 20% of the cells fall below the minimum expected frequency value of 5, this leads to less reliable results. As a result, there is insufficient evidence to reject H0. For future analyses, merging categories or expanding the sample size, or using an alternative test, such as the Fisher's exact test, could be considered to improve the validity of the results and confirm these results.

<u>Accessibility and housing type</u>

The chi-square test showed that there are no statistically significant differences when looking at the type of housing where someone lives in Woensel West and the accessibility of the following amenity categories: Sports, amenities for social gathering, healthcare amenities and secondary schools within walking distance. These results are supported by all tests performed; (Pearson's chi-square, continuity correction, likelihood ratio and Fisher's exact test).

These tests support these conclusions because p-values are well above the usual significance level of p = 0.05 and H0 cannot be rejected based on these results.

In contrast, the expected frequencies WELL met the assumptions of the Chi-square tests of sports amenities, healthcare amenities, within walking distance. For these amenities, H0 cannot be rejected based on the significance values above p = .05 are and the results that did meet the Chi-square assumptions.

However, this does not apply to amenities for social meeting, primary schools and secondary schools, within walking distance when looking at the assumptions of the tests about these amenities. Tests show that the results do not meet the Chi-square assumptions, and thus there is insufficient evidence to confidently state the conclusion regarding rejecting H0, as more than 20% of the results at these amenities are below the expected frequency of 5

Primary schools within walking distance showed significantly large differences between residents of private sector housing and those of social rented housing, with the p-value scoring below the maximum value of p = .05. Based on this, H0 should be rejected for the accessibility comparison between residents of social rented and private sector housing for these amenities. For the practical situation, this means that residents of social housing have more accessibility to primary schools than residents of private sector housing.

However, these tests did not meet the expected frequencies and therefore did not meet the assumptions of the Chi-squared test, with some of the results for more below the 20% expected frequency number. This affects the power and reliability of both tests.

In addition, there is also a significant difference and sufficient evidence to reject H0 when looking at childcare locations within walking distance, where residents of a certain housing type and accessibility differ significantly. Indeed, the results show that residents of social rented housing have more accessibility to childcare locations than residents of private sector housing within walking distance. This is supported by the test performed (Pierson Chi-squared), which allows H0a to be rejected for this amenity.

Accessibility results within 15 minutes of cycling distance per amenity in general

Table 61 General accessibility of the amenities within cycling distance (all respondents together)

Amenity type	Accessible	Inaccessible	Not applicable	Accessibility results without results: 'not applicable/ don't know'
Primary schools	36%	3%	61%	93%
Sports amenities	74%	10%	8%	88%
Secondary schools	26%	4%	69%	86%
Amenities for social meeting	88%	4%	14%	85%
Healthcare amenities	73%	13%	14%	85%
Childcare sites	31%	8%	61%	80%

Table 62 shows the average accessibility per amenity within cycling distance from all inhabitants of Woensel West. The first three columns show the unfiltered results of the survey, with column 1 reflecting accessibility, column 2 reflecting inaccessibility and the third column reflecting the share that indicated not knowing how to answer, or not applicable. To avoid creating a distorted picture, column four is the most important, not counting the 'not applicable' answers.

Here it can be seen that primary schools score the highest when it comes to accessibility, then sports amenities, secondary schools, then healthcare amenities and childcare locations with the least accessibility. Since it is relevant to know whether there is a significant difference between target groups that there may be a higher perceived level of inaccessibility.

Results per target group within 15 minutes of cycling distance

Below are the results per target group, which were then calculated of significance by the chi-squared test to see whether there are significant differences when it comes to the accessibility of the amenities within cycling distance.

Results sports amenities within 15 minutes of cycling

Table 62 Accessibility of sports amenities cycling distance

Results sports amenities within 15 minute cycling distance

Target group	Size of target group (n)	Accessible	Inaccessible
1-2 years	58	76%	9%
3-5 years	23	70%	13%
6-15 years	22	73%	9%
15 years and longer	11	73%	9%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility sports amenities cycling distance	94	82.5%	20	17.5%	114	100.0%

target groups * accessibility sports amenities cycling distance Crosstabulation

Count

		accessibility sports amenities cycling distance		
		yes	no	Total
target groups	1-2 years	44	4	48
	3-5 years	16	3	19
	6-15 years	16	2	18
	15 years and over	8	1	9
Total		84	10	94

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.805[a]	3	.848
Likelihood Ratio	.763	3	.858
N of Valid Cases	94		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .96.

Image 52 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility sports amenities within cycling distance

A Pearson Chi-square test was conducted to investigate whether there is a significant association between the length of time people live in Woensel West and the accessibility of sports amenities within cycling distance. The data included four target groups: 1-2 years, 3-5 years, 6-15 years, and 15 years and over. This does not include 'not applicable' results. Of the 114 cases, 94 were valid and 20 cases were missing.

The Pearson Chi-square test showed that there was no statistically significant association between the age groups and the accessibility of sports amenities within cycling distance (χ^2 (3) = .805, p = .848). This shows that the accessibility of sports amenities within cycling distance does not differ significantly between the different target groups and the degree of how long people live in Woensel West is not an important factor.

It should be noted that 37.5% of the cells have an expected frequency of less than 5, with a minimum expected value of .96. This may indicate limited power of the test and may affect the reliability of the

conclusions. On the basis that the test results do not meet the Chi-square assumptions, H0 should not be rejected.

Table 63 Accessibility of sports amenities between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*71%*	*12%*
Social housing	*73*	*74%*	*7%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * sports amenities cycling distance	95	83.3%	19	16.7%	114	100.0%

ID * sports amenities cycling distance Crosstabulation

Count

		sports amenities cycling distance		
		yes	no	Total
ID	private sector house	30	5	35
	social rent	54	6	60
Total		84	11	95

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.397[a]	1	.529		
Continuity Correction[b]	.088	1	.766		
Likelihood Ratio	.388	1	.534		
Fisher's Exact Test				.527	.376
N of Valid Cases	95				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.05.

b. Computed only for a 2x2 table

Image 53 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector house – social rent) and accessibility sports amenities within cycling distance

A Chi-square test was conducted to examine whether there is a statistically significant relationship between housing type (private sector house versus social rent) and accessibility of sports amenities within cycling distance. 'Not applicable' responses were excluded, yielding 95 valid results (87.5%) and 19 missing (16.7%).

The Pearson Chi-Square test shows that there is no statistically significant relationship between housing type and accessibility of sports amenities within cycling distance (χ^2 (1) = .397, p = .529). This suggests that the accessibility of sports amenities within cycling distance does not differ significantly between residents of social rented housing and residents of private sector housing to sports amenities within cycling distance. based on this level of significance, H0 should not be rejected. However, a note should be made that 25% of cells (1) have an expected frequency lower than 5, with a minimum expected value of 4.05. This may affect the robustness of the Chi-squared test. In addition, the relatively small sample size may also affect the reliability of the results. Based on the failure to meet the assumptions, H0 may also not be rejected because of this.

Results for amenities for social meetings (hospitality) per target group

Table 64 Accessibility of amenities for social meetings (hospitality) within cycling distance

Within 15-minutes of cycling distance per target group

Target group	Size of target group (n)	Accessible	Inaccessible
1-2 years	58	84%	7%
3-5 years	23	91%	4%
6-15 years	22	86%	0%
15 years and longer	11	100%	0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility amenities for social meetings C.D.	105	92.1%	9	7.9%	114	100.0%

target groups * accessibility amenities for social meetings C.D. Crosstabulation

Count

		accessibility amenities for social meetings C.D.		
		yes	no	Total
target groups	1-2 years	49	4	53
	3-5 years	21	1	22
	6-15 years	19	0	19
	15 years and over	11	0	11
Total		100	5	105

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.409[a]	3	.492
Likelihood Ratio	3.705	3	.295
N of Valid Cases	105		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .52.

Image 54 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility amenities for social meetings within cycling distance

A Chi-square test was conducted to examine whether there is a statistical relationship between target groups and the degree of how long they have lived in Woensel West and the accessibility of the amenities for social meetings. 'Not applicable' results were not included. Out of 114 results, 105 are valid (92.1%) and 9 cases are missing (7.9%).

Pearson Chi-square test shows that there is no statistically significant association between target groups and accessibility of the amenities for social meetings (χ^2 (3) = 2.409, p = .492). This implies that the accessibility of the amenities for social gatherings does not differ significantly between the different target groups and the length of time they live in Woensel West. It can be concluded that amenity accessibility is evenly distributed among the groups. This suggests that duration is not a determining factor for the accessibility of accessible amenities.

It should be noted that 50% of the cells have an expected frequency of less than 5, with a minimum expected value of .052. This may indicate a limited power of the test and may affect the reliability of the conclusions as it does not meet the assumptions. On this basis, H0 should not be rejected.

Table 65 Accessibility of amenities for social meetings (hospitality) between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*88%*	*0%*
Social housing	*73*	*90%*	*7%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * amenities social meetings cycling distance	105	92.1%	9	7.9%	114	100.0%

ID * amenities social meetings cycling distance Crosstabulation

Count

		amenities social meetings cycling distance		
		yes	no	Total
ID	private sector house	36	0	36
	social rent	64	5	69
Total		100	5	105

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.739[a]	1	.098		
Continuity Correction[b]	1.374	1	.241		
Likelihood Ratio	4.328	1	.037		
Fisher's Exact Test				.162	.116
N of Valid Cases	105				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.71.

b. Computed only for a 2x2 table

Image 55 Output Crosstabs Chi-Square Tests (SPSS) - target groups (private sector house – social rent) and accessibility amenities for social meetings within cycling distance

A Chi-square test was done to examine whether there was a significant relationship between housing type (private sector house vs social rent) and accessibility of the amenities for social meetings within cycling distance. Out of 114 cases, 105 were valid (92.1%) and 9 cases were missing (7.9%).

The Pearson Chi-square test showed that there was no statistically significant relationship between housing type and accessibility of the amenities for social meetings within cycling distance. (χ^2 (1) = 2.739, p = .098). However, although the p-value is less than .05 for the Likelihood Ratio, the Pearson Chi-Square test is the primary test, with the value here not significant. This implies that the accessibility of the amenities for social meetings within cycling distance does not differ significantly between residents living in the different housing types. Based on these results, we can conclude that there is no significant relationship between housing type and the accessibility of the amenities for social meetings within cycling distance. The distribution of the accessibility of these amenities does not differ significantly between residents of private sector housing and residents of social rented housing.

However, a note should be made that two cells (50%) have an expected frequency of less than 5, with a minimum expected value of 1.71. This may affect the robustness of the Chi-square test. In addition,

the small sample size and number of missing cases may affect the reliability of the results. Based on the significance above .05 and not meeting the assumptions of the Chi-squared test, H0a should not be rejected. A subsequent study with a larger sample size may be needed to confirm these findings.

Results of healthcare amenities per target group

Table 66 Accessibility of healthcare amenities within cycling distance

Within 15-minutes of Cycling distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*64%*	*16%*
3-5 years	*23*	*74%*	*13%*
6-15 years	*22*	*82%*	*14%*
15 years and longer	*11*	*100%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility Healthcare offer cycling distance	114	100.0%	0	0.0%	114	100.0%

target groups * accessibility Healthcare offer cycling distance Crosstabulation

Count

		accessibility Healthcare offer cycling distance			
		yes	no	not applicable	Total
target groups	1-2 years	37	9	12	58
	3-5 years	17	3	3	23
	6-15 years	18	3	1	22
	15 years and over	11	0	0	11
Total		83	15	16	114

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.512[a]	6	.203
Likelihood Ratio	11.665	6	.070
N of Valid Cases	114		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is 1.45.

Image 56 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility healthcare offer within cycling distance

A Chi-square test was conducted to examine whether there was a significant relationship between four different target groups where the length of time someone lived in the neighbourhood and accessibility to healthcare amenities within cycling distance. Of the 114 cases, 114 (100%) were valid and there were no missing cases (0%).

The Pearson Chi-square test showed that there was no statistically significant relationship between target groups and accessibility to healthcare amenities within cycling distance (χ^2 (6) = 8.512, p = .203). This implies that the accessibility of healthcare amenities within cycling distance does not differ significantly between the different target groups according to the extent they live longer in Woensel West. Based on these results, it can be concluded that the accessibility of healthcare amenities is

gradually distributed among the target groups, implying that duration is not a determining factor for the accessibility of healthcare amenities within cycling distance.

However, a note should be made that the assumptions of the Chi-square test are not met. 50% of the cells have an expected frequency of less than 5, with a minimum expected value of 1.45. This may indicate limited power of the test and may affect the robustness of the conclusions. Future studies with a larger sample size may be needed to confirm these findings. Based on significance and failure to meet assumptions, H0 should not be rejected. There is insufficient result to fully confirm the conclusion. Therefore, a follow-up study can be done with a larger sample size to confirm these findings.

Table 67 Accessibility healthcare amenities between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*71%*	*15%*
Social housing*	*73*	*77%*	*12%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * healthcare offer cycling distance	105	92.1%	9	7.9%	114	100.0%

ID * healthcare offer cycling distance Crosstabulation

Count

		healthcare offer cycling distance					
		yes	no	Niet	Niet van toepassing / weet niet	Wel	Total
ID	private sector house	17	3	3	7	11	41
	social rent	55	9	0	0	0	64
Total		72	12	3	7	11	105

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	40.984[a]	4	<.001
Likelihood Ratio	48.282	4	<.001
N of Valid Cases	105		

a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is 1.17.

Image 57 Output Crosstabs Chi-Square Tests (SPSS) - target groups (free sector – social rent) and accessibility healthcare offered within cycling distance

A Chi-square test was conducted to examine whether there was a significant relationship between housing type (private sector house vs social rent) and accessibility of health care within cycling distance. Out of 114 cases, 105 were valid (92.1%) and 9 cases were missing (7.9%).

The Pearson Chi-square test showed that there was a statistically significant relationship between housing type and accessibility of health care within cycling distance (χ^2 (4) = 40.984, p < .001). This means that the accessibility of health care within cycling distance differs significantly between the different housing types. Based on these results, it can be concluded that there is a significant relationship between housing type and accessibility of healthcare amenities within cycling distance.

The distribution of the accessibility of these amenities differs significantly between residents of private sector houses and social rent houses, with residents of social rent houses more often having access to healthcare within cycling distance than residents of private sector houses.

However, it should be noted that 60% of the cells have an expected frequency of less than 5, with a minimum expected value of 1.17. This may affect the robustness of the chi-square test. On this basis, H0 should be rejected. Future studies with a larger sample size may be needed to confirm these findings.

Results of childcare locations by target group

Table 68 Accessibility of childcare locations within cycling distance

Within 15-minutes of cycling distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*26%*	*5%*
3-5 years	*23*	*26%*	*17%*
6-15 years	*22*	*41%*	*5%*
15 years and longer	*11*	*36%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility Childcare sites cycling distance	45	39.5%	69	60.5%	114	100.0%

target groups * accessibility Childcare sites cycling distance Crosstabulation

Count

		accessibility Childcare sites cycling distance		
		yes	no	Total
target groups	1-2 years	16	4	20
	3-5 years	7	4	11
	6-15 years	9	1	10
	15 years and over	4	0	4
Total		36	9	45

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.466[a]	3	.325
Likelihood Ratio	4.098	3	.251
N of Valid Cases	45		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .80.

Image 58 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility of childcare locations within cycling distance

A Chi-square test was conducted to examine whether there was a significant association between different groups by degree of time living in Woensel West and accessibility of childcare locations within cycling distance. Out of 114 cases, 45 were valid (39.5%) and 69 cases were missing (60.5%).

The Pearson Chi-squared test showed that there was no statistically significant association between the target groups to the extent they live in Woensel West and the accessibility of childcare locations within cycling distance (χ^2 (3) = 3.466, p = .325). This implies that the accessibility of childcare locations within cycling distance does not differ significantly between the different target groups and that the degree of time the target groups live in Woensel West is not a determinant of the accessibility of childcare locations within cycling distance between the different target groups. On this basis, H0 should not be rejected.

It should be noted that 62.5% of the cells have an expected frequency of less than 5, with a minimum expected value of 0.80. This may indicate limited power of the test and may affect the reliability of the conclusions. Future studies with a larger sample size may be needed to confirm these findings.

Table 69 Accessibility of childcare locations between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*27%*	*12%*
Social housing	*73*	*33%*	*5%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * accesibility childcare locations cycling distance	44	38.6%	70	61.4%	114	100.0%

ID * accesibility childcare locations cycling distance Crosstabulation

Count

		accesibility childcare locations cycling distance		
		yes	no	Total
ID	private sector	11	5	16
	social rent	24	4	28
Total		35	9	44

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.801[a]	1	.180		
Continuity Correction[b]	.909	1	.340		
Likelihood Ratio	1.743	1	.187		
Fisher's Exact Test				.250	.170
N of Valid Cases	44				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.27.

b. Computed only for a 2x2 table

Image 59 Output Crosstabs Chi-Square Tests (SPSS) - target groups (free sector – social rent) and accessibility of childcare locations within cycling distance

A Chi-square test was conducted to examine whether there was a significant association between residents and housing type (private sector house versus social rent) and accessibility of childcare locations. Out of 114 cases, 44 were valid (38.6%) and 70 were missing (61.4%).

The Pearson Chi-square test showed that there was no statistically significant relationship between housing type and accessibility of childcare locations within cycling distance (χ^2 (1) = 1.801, p = .180). This suggests that the accessibility of childcare locations within cycling distance does not differ significantly between housing types. Based on this, it can be concluded that the distribution of inaccessibility of these amenities does not differ significantly between residents of private sector houses and social rent houses and H0 is not rejected.

However, there are limitations to the test. 25% had an expected frequency of less than 5, with a minimum expected value of 3.27. This may affect the robustness of the Chi-square test. This also applies to the small sample size and the high number of missing cases that affects reliability. Further studies with a larger sample size may be needed to confirm these findings.

Results of primary schools by target group

Table 70 Accessibility of primary schools within cycling distance

Within 15-minutes of cycling distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*32%*	*3%*
3-5 years	*23*	*35%*	*4%*
6-15 years	*22*	*50%*	*0%*
15 years and longer	*11*	*36%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * Primary schools cycling distance	44	38.6%	70	61.4%	114	100.0%

target groups * Primary schools cycling distance Crosstabulation

Count

		Primary schools cycling distance		
		yes	no	Total
target groups	1-2 years	18	2	20
	3-5 years	8	1	9
	6-15 years	11	0	11
	15 years and over	4	0	4
Total		41	3	44

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.677[a]	3	.642
Likelihood Ratio	2.622	3	.454
N of Valid Cases	44		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .27.

Image 60 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility primary schools within cycling distance

A Chi-square test was conducted to investigate whether there is a significant relationship between different groups by degree of time they live in Woensel West and the accessibility of primary schools within cycling distance. out of 114 cases, 44 were valid (38.6%) and 70 were missing (61.4%).

The Pearson chi-square test showed that there was no statistically significant relationship between the target groups to the extent that they live in Woensel West of a certain duration and the accessibility of primary schools within cycling distance (χ^2 (3) = 1.677, p = .642). This implies that the accessibility of to primary schools within cycling distance does not differ significantly between the different age groups.

Based on these results, we can conclude that accessibility to primary schools within cycling distance is equally distributed among the different age groups. This result suggests that age is not a determinant of accessibility to accessible primary schools within cycling distance and H0 cannot be rejected. It should be noted that 62.5% of the cells had an expected frequency of less than 5, with a minimum expected value of 0.27. This may indicate a limited power of the test and may affect the robustness of the conclusions. Future studies with a larger sample size may be needed to confirm these findings.

Table 71 Accessibility of primary schools between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*32%*	*5%*
Social housing	*73*	*36%*	*1%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * primary schools cycling distance	44	38.6%	70	61.4%	114	100.0%

ID * primary schools cycling distance Crosstabulation

Count

		primary schools cycling distance		
		yes	no	Total
ID	private sector house	13	2	15
	social rent	28	1	29
Total		41	3	44

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.521[a]	1	.218		
Continuity Correction[b]	.363	1	.547		
Likelihood Ratio	1.424	1	.233		
Fisher's Exact Test				.264	.264
N of Valid Cases	44				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.02.

b. Computed only for a 2x2 table

Image 61 Output Crosstabs Chi-Square Tests (SPSS) - target groups (free sector house – social rent) and accessibility of primary schools within cycling distance

A Chi-square test was conducted to examine whether there was a significant association between residents and housing type (private sector house versus social rent) and accessibility of primary schools. Out of 114 cases, 44 were valid (38.6%) and 70 were missing (61.4%)

The Pearson Chi-square test showed that there was no statistically significant association between housing type and accessibility of primary schools within cycling distance ($\chi^2(1) = 1.521$, $p = .218$). This implies that the accessibility of primary schools within cycling distance does not differ significantly between housing types. The distribution of accessibility to these amenities does not differ significantly between residents of private sector houses and social rent houses. On this basis, H0 cannot be rejected.

However, the test does not meet all the assumptions, namely because 50% of the cells are below an expected frequency of less than 5, with a minimum expected value of 1.02. This may affect the robustness of the chi-square test. In addition, the small sample size and high number of missing cases may affect the reliability of the results. Further studies with a larger sample size may be needed to confirm these findings.

Results of secondary schools by target group

Table 72 Accessibility of secondary schools within cycling distance

Within 15-minutes of cycling distance

Target group	***Size of target group (n)***	***Accessible***	***Inaccessible***
1-2 years	*58*	*30%*	*6%*
3-5 years	*23*	*30%*	*9%*
6-15 years	*22*	*77%*	*0%*
15 years and longer	*11*	*27%*	*0%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
target groups * accessibility secondary schools	29	25.4%	85	74.6%	114	100.0%

target groups * accessibility secondary schools Crosstabulation

Count

		accessibility secondary schools		
		yes	no	Total
target groups	1-2 years	10	3	13
	3-5 years	3	3	6
	6-15 years	3	4	7
	15 years and over	1	2	3
Total		17	12	29

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.487[a]	3	.322
Likelihood Ratio	3.593	3	.309
N of Valid Cases	29		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is 1.24.

Image 62 Output Crosstabs Chi-Square Tests (SPSS) - target groups (duration of living in Woensel West) and accessibility of secondary schools within cycling distance

A Chi-square test was conducted to investigate whether there is a significant relationship between different target groups and the accessibility of secondary schools within cycling distance. The data

included four target groups, each with varying degrees of time living in Woensel West. Of the 114 cases, 29 were valid (25.4%) and 85 missed (74.6%)

The Pearson Chi-square test showed that there was no statistically significant association between the age groups and the accessibility of secondary schools within cycling distance (χ^2 (3) = 3.487, p = .322). This implies that the accessibility of secondary schools does not differ significantly between age groups. Based on these results, we can conclude that the accessibility of secondary schools is evenly distributed among the different target groups. This result suggests that the duration that groups live in Woensel West is not a determinant of the availability of accessible secondary schools. On this basis, H0 is not rejected.

It should be noted that 75% of the cells have an expected frequency of less than 5, with a minimum expected value of 1.24. This may indicate a limited power of the test and may affect the reliability of the conclusions. Future studies with a larger sample size may be needed to confirm these findings.

Table 73 Accessibility of secondary schools between private sector housing and social housing within cycling distance

Within 15-minutes of cycling distance

People living in….	***Size of target group (n)***	***Accessible***	***Inaccessible***
Private sector housing	*41*	*17%*	*5%*
Social housing	*73*	*30%*	*4%*

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
ID * secondary school cycling distance	34	29.8%	80	70.2%	114	100.0%

ID * secondary school cycling distance Crosstabulation

Count

		secondary school cycling distance		
		yes	no	Total
ID	private sector house	8	2	10
	social rent	22	2	24
Total		30	4	34

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.926[a]	1	.336		
Continuity Correction[b]	.143	1	.705		
Likelihood Ratio	.854	1	.355		
Fisher's Exact Test				.564	.334
N of Valid Cases	34				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.18.

b. Computed only for a 2x2 table

Image 63 Output Crosstabs Chi-Square Tests (SPSS) - target groups (free sector – social rent) and accessibility secondary schools within cycling distance

A Chi-square test was conducted to examine whether there was a significant relationship between housing type (private sector house versus social rent) and accessibility of secondary schools within cycling distance. Out of 114 cases, 34 were valid (29.8%) and 80 were missing (70.2%).

The Pearson Chi-square test showed that there was no statistically significant relationship between housing type and accessibility of secondary schools within cycling distance (χ^2 (1) = 0.926, p = .336). This implies that the accessibility of secondary schools within cycling distance does not differ significantly between housing types. The distribution of accessibility of these amenities does not differ significantly between residents of private sector houses and social rent houses. As a result, H0 cannot be rejected.

However, it should be noted that 50% of the cells have an expected frequency of less than 5 with a minimum expected value of 1.8. This may affect the power and reliability of the chi-square test. The relatively small sample size and high number of missing cases may affect the reliability of the results. Further studies with a larger sample size may be needed to confirm these findings.

Conclusion question 8

Table 74 Ranking amenities against availability within 15 minutes cycling

Ranking amenities by accessibility	**Ranking amenities by inaccessibility.**	**Distribution of amenities by accessibility 15-minute cycling excluding the responses "not applicable/ don't know"**
Amenities for social meeting (88%)	Sports amenities (10%)	Amenities for social meetings (95%)
Sports amenities (73%)	Childcare locations (8%)	Primary schools (93%)
Healthcare offer (73%)	Healthcare offer (5%)	Sports amenities (88%)
Primary schools (36%)	Secondary schools (4%)	Secondary schools (86%)
Childcare locations (31%)	Amenities for social meetings (4%)	Healthcare offer (85%)
Secondary schools (26%)	Primary schools (3%)	Childcare locations (80%)

General

When it comes to the general accessibility of the amenities for all residents, it can be seen from the results of Question 8, *Table 75*, column three, shows the results when excluding the responses "not applicable/ don't know." This column indicates that several amenities are relatively inaccessible, and there is no opportunity to use them.

In the table, this relates specifically to the following amenities that are within 15-minute cycling distance: the childcare locations, with 80% indicating the ability to use this offering and 20% indicating the inability to do so. The healthcare offer is accessible to 85% in contrast to 15% of respondents who indicated that the healthcare offer is inaccessible to use. The same goes for the secondary schools which are accessible to 86% and inaccessible to 14% of respondents. As for sports offerings, they are accessible to 88% of respondents and inaccessible to 12% of respondents. Finally, if we look at the accessibility of primary schools and social meetings it generally scores relatively high in columns one and three, with inaccessibility being relatively low. Nevertheless, overall, the amenities score relatively high when it comes to overall accessibility. Per target group will be elaborated in the next section.

Comparison between availability between walking and cycling.

Table 75 Comparison of availability between walking/ cycling distance

Type of amenity	Accessibility walking/cycling	Inaccessible walking/cycling	Not applicable walking/ cycling	Accessibility if 'not applicable not included
Sports amenities	47% / 74%	22% / 10%	31% / 8%	68% / 88%
Offer for social meetings	82% / 88%	7% / 4%	11% / 14%	82% / 95%
Healthcare offer	63% / 73%	18% / 13%	18% / 14%	77% / 85%
Childcare locations	25% / 31%	33% / 8%	64% / 61%	67% / 80%
Primary Schools	31% / 36%	4% / 3%	65% / 61%	87% / 93%
Secondary schools	15% / 26%	11% / 4%	75% / 69%	59% / 86%

When a comparison is made with accessibility between walking and cycling in general across all respondents, there is an exponentially large difference in accessibility between the accessibility between walking and cycling, in which cycling has a relatively higher accessibility rate.

When looking at the accessibility of the amenities for social contact generally shows little difference between walking and cycling when looking at the column, in contrast to primary schools and childcare locations. When looking at column two these amenities have an exponentially lesser degree of inaccessibility on behalf of the entire sample. If column three is looked at, there are large differences between sports amenities and healthcare amenities, with 'not applicable' filled in less often within a 15-minute cycling distance. This contrasts with amenities for social meetings, where within cycling distance is a relatively small increase of 3% Looking at the last column, there are large differences at sports amenities, childcare locations and secondary schools when it comes to accessibility between 15-minute walking and 15-minute cycling.

If we compare the accessibility among target groups waarbij de duur dat mensen in Woensel West wonen en de toegankelijkheid per voorziening, is het volgende te concluderen.

Accessibility by target group by length of time people live in Woensel West

The Chi-square tests revealed that there are no statistically significant differences when looking at the duration of how long someone lives in Woensel West and the accessibility to sports amenities, social meeting amenities, healthcare, childcare locations, primary schools and secondary schools within walking distance. This is supported by the results, with the results scoring well above the p-value. However, since the assumptions of the Chi-square test are violated, in that for these amenities more than 20% of the cells fall below the minimum expected frequency value of 5, this leads to less reliable results. As a result, there is insufficient evidence to reject H0. This also applies to sports amenities, social meeting amenities, healthcare, primary schools and secondary schools within cycling distance.

Accessibility by target group by housing type

The Chi-square test showed that there are no statistically significant differences when looking at the type of housing where someone lives in Woensel West and the accessibility of the following amenity categories: sports, amenities for social meetings, healthcare amenities and secondary schools within walking distance. These results are supported by all tests performed; (Pearson's chi-square, continuity

correction, likelihood ratio and Fisher's exact test). These tests support these conclusions because p-values are well above the usual significance level of p = 0.05 and H0 cannot be rejected based on these results. This is also true for sports amenities, amenities for social meetings, childcare locations, primary schools and secondary schools within cycling distance.

In contrast, the expected frequencies HAVE met the assumptions of the Chi-Square tests of sports amenities, and healthcare amenities, within walking distance. Neither did any chi squared tests of the amenities within cycling distance. For these amenities, H0 cannot be rejected based on the significance values above p = .05 and the results that do meet the Chi-square assumptions.

However, this does not apply to amenities for social meetings, primary schools and secondary schools, within walking distance when looking at the assumptions of the tests about these amenities. Tests show that the results do not meet the Chi-square assumptions, and thus there is insufficient evidence to confidently state the conclusion regarding rejecting H0, as more than 20% of the results at these amenities are below the expected frequency of 5. The same is true for sports amenities, social meetings, childcare locations, primary schools and secondary schools within cycling distance.

Primary schools within walking distance showed significantly large differences between residents of private sector housing and those of social rented housing, with the p-value scoring below the maximum value of p = .05. Based on this, H0 should be rejected for the accessibility comparison between residents of social rented and private sector housing for these amenities. For the practical situation, this means that residents of social housing have more accessibility to primary schools than residents of private sector housing. The same is also true for healthcare amenities within cycling distance, with residents of social housing having more access to healthcare amenities.

However, these tests did not meet the expected frequencies and hence the assumptions of the Chi-squared test, with some of the results for more than the 20% expected frequency number. This affects the power and reliability of both tests.

In addition, there is also a significant difference and sufficient evidence to reject H0a when looking at childcare locations within walking distance, where residents of a certain housing type and accessibility differ significantly. Indeed, the results show that residents of social rented housing have more accessibility to childcare locations than residents of private sector housing within walking distance. This is supported by the test performed (Pierson Chi-squared), which allows H0a, to be rejected for this amenity. Finally, there are no amenities within cycling distance that show significant differences and have sufficient evidence to confirm this.

Question 9: "What amenities would you like to have within 15 minutes of walking or cycling?"
Question 9 explicitly asked, "What amenity would you like to have within 15 minutes of walking or cycling?" Here the options by facility type were: "walking", "cycling" and "not applicable" This question was asked to see where the needs of Woensel West residents are. From this, the following results were gathered:

Table 76 Outcome Survey Question "What amenity would you like to have within a 15-minute walk or cycle?"

Facility type	Hiking	Cycling	Not applicable/ don't know
Supermarket	90%	5%	4%
Restaurants and cafes	75%	18%	6%
Drugstore	67%	25%	8%
Neighbourhood House	55%	11%	34%
Pharmacy	54%	35%	11%
DOCTOR	50%	39%	11%
Gym	49%	36%	15%
Playgrounds	49%	11%	40%
Sports Field	46%	24%	31%
Other retail	40%	47%	12%
Primary School	39%	12%	49%
Dentist	27%	59%	14%
Consultation Office	24%	25%	52%
Exhibition space	21%	48%	31%
Psychologist	15%	53%	33%
Obstetric	11%	33%	57%
Museum	11%	63%	26%
Gym	16%	45%	40%
High School	10%	40%	51%

The results show that a clear need for supermarkets, drugstores, restaurants and cafes, a community centre, a doctor, playgrounds and sports fields within walking distance, among others. Within biking distance, there is a relatively high need for museums, exhibitions, a dentist, other retail, a gymnasium and a high school.

The table below shows the breakdown by amenity, what respondents would prefer to have within 15-minute walking and cycling distance. The table is ordered by the need for certain amenities within walking distance. It can be seen from the results that there is a strong need for a supermarket, restaurants and cafes, a drugstore, a community centre, a pharmacy, a gym, playgrounds, a sports field and other retail within walking distance.

In addition, the last column shows the size by amenity to which it is applicable. A low result "not applicable" means that this amenity applies to a relatively larger group. So, to see, it appears that the supermarket is wanted the most, after within walking distance and this amenity is applicable for 96%. This also applies, for example, to cafes, the drugstore, a community centre and the family doctor. Amenities within cycling distance seem to be a lower priority in the area compared to those that are most desired within walking distance. This is of course also true for certain amenities that are more desired within walking distance compared to biking distance.

Therefore, *Table 77* shows the distribution by amenity that respondents would prefer to have within 15-minute walking and cycling distance. The table is ordered by the need for certain amenities within

walking distance. At first sight, the results show that there is a strong need for a supermarket, restaurants and cafes, a drugstore, a community centre, a pharmacy, a gym, playgrounds, a sports field and other retail within walking distance. However, the last column shows the size for each amenity to which it is applicable. A low result 'not applicable' means that this amenity applies to a relatively larger group.

Thus, the results show that the supermarket is most wanted within walking distance and this amenity applies to 96% of the population. This also applies, for example, to cafés, the drugstore, a community centre and the doctor. If we make an overview of amenities within walking and cycling distance by priority according to the survey, Table 78 shows the ranking per amenity for walking and Table 79 for cycling. These results have been calculated through the following formula: percentage of walking/cycling * size group of application = relevance/most wanted facility by the population of Woensel West.

Table 77 Most wanted amenities within walking distance

Amenities ranked by priority within walking distance	Needs per amenity	(Size) Applicable target group	needs * applicable = Most wanted
Supermarket	90%	96%	86%
Restaurants and cafés	75%	94%	71%
Drugstore	67%	92%	62%
Pharmacy	54%	89%	48%
Doctor	50%	89%	45%
Gym	49%	85%	42%
Community centre	55%	66%	36%
Other retail shops	40%	88%	35%
Sportsfield	46%	69%	32%
Playgrounds	49%	60%	29%
Dentists	27%	86%	23%
Primary schools	39%	51%	20%
Exhibition hall	21%	69%	14%
Consultation office	24%	48%	12%
Psychologist	15%	67%	10%
Gymnasium	16%	60%	10%
Museum	11%	74%	8%
Secondary school	10%	49%	5%
Obestric	11%	43%	5%

Table 78 Most wanted amenities within cycling distance

Amenities by priority within cycling distance	Needs per amenity	(Size) Applicable target group	needs * applicable = Most wanted

Dentists	59%	86%	51%
Museum	63%	74%	47%
Other retail shops	47%	88%	41%
Psychologist	53%	67%	36%
Doctor	39%	89%	35%
Exhibition hall	48%	69%	33%
Pharmacy	35%	89%	31%
Gym	36%	85%	31%
Gymnasium	45%	60%	27%
Drugstore	25%	92%	23%
Secondary school	40%	49%	20%
Restaurants and cafés	18%	94%	17%
Sportsfield	24%	69%	17%
Obestric	33%	43%	14%
Consultation office	25%	48%	12%
Community centre	11%	66%	7%
Playgrounds	11%	60%	7%
Primary schools	12%	51%	6%
Supermarket	5%	96%	5%

The results show a clear need for supermarkets, restaurants and cafes, a drugstore, a Pharmacy, a community centre and a doctor amongst others, within walking distance. Within cycling distance, there is a relatively high need for a dentist, museums, other retail shops, a psychologist and an exhibition space. In addition, the results also show that amenities within cycling distance have a lower priority in the area compared to those that are most desired within walking distance. This is also true for certain amenities that are more desired within walking distance compared to cycling distance.

Now that the results have been discussed from the survey, and indicated their importance within this research, the next paragraph will elaborate on the results from the interviews that complement the answer to the sub-question and in some cases apply triangulation to the results just discussed.

Question 10: "If you entered option otherwise in question 9, what is this amenity?"
Question 10 was asked because question nine had a multiple-choice answer option and question 10 provided an additional answer option through an open-ended question if the answer option in question nine was not present. From this several answers are listed below of which amenity they prefer. Looking at the results, I think that this question was not always filled in properly, as many answers to this question are under Question 11.

Question 11 asks emphatically, "You have come to the end of the survey, do you have any comments or suggestions?" then many amenities are also mentioned there. For question 10, I name the results that came out of this.

Table 79 Results survey question 10

Note	Number of times mentioned
Off-leash field for dogs	**3 x**
More car charging stations	1 x
Nightclub/ night culture/ nightlife, more terraces	1 x
Space for taichi, yoga	1 x
Outdoor play areas with water, sand and branches/construction wood. Catering establishments within walking distance leave because no larger premises are available, or the terrace is cut in half by spatial adjustments	1 x
Speech therapy practice for children in the neighbourhood	1 x
Bus stops	1 x
Amenities for waste disposal (plastic, paper and glass)	2 x
Halal lunchroom	1 x
Halal lunchroom, Action store, Blowdry bar, good nail salon with pedicure option, location where you can print and a car garage.	1 x
Supermarket	2 x
A water taps at the community garden on Groenewoudseweg. Also, a connection for water for Children's Holiday Week.	1 x
Bank ATM	1 x
Cafe meeting place	1 x

Since question 10 asks about which amenities are desirable and this was answered particularly in question 11, I list the enumerated results of question 10 and question 11 to get an overall view of how often which amenity was mentioned. Below in the right column, all answers are added together in frequency in which they occur and put in a ranking from common to less common. *Table 81* shows the responses and counts about the amenities that are mentioned. These comments can provide additional insight into the accessibility and presence of current offerings within a 15-minute walking and cycling distance. It is very noticeable that there is an exponential increase in residents' desire for a supermarket. This need comes from almost all target groups: the gentrifiers/ residents of private-sector housing / residents of social housing and is reaffirmed here.

Table 80 Overview of which amenities are desired, ranked by quantity (results question 10 & 11)

Supermarket	21 x
Stores	6 x
Drugstore	5 x
Nature play areas/ playground	5 x
Drugstore	5 x
Less traffic	4 x
Green spaces	4 x
Dog walking field	3 x
Gym	3 x
Waste collection point: paper, plastic and glass	3 x
Bus stops	3 x
Bars, cafes restaurants, lunchroom, more terraces	2 x
DOCTORs	2 x
Speech therapy practice for children in the neighbourhood	1 x
Dentist	1 x
Psychologist	1 x
Baker	1 x
Daycare	1 x
Halal lunchroom	1 x
Bank ATM	1 x

Question 11

As mentioned with question 10, question 11 explicitly asks, "You have come to the end of the survey, do you have any comments or suggestions?" below are all comments that provide additional insights, on which *Table 81* of question 10 is based.

- Dog walking field
- I want more places to meet friends, maybe also a small place for events (concerts, popup market). By the way, very nice that you guys are working on this! It is appreciated ;)
- Charging points (car)
- "Lots of new residents but no growth in supermarkets and DOCTORs. I would like to have more of that"
- Availability of doctors, dentists, psychologist
- A supermarket nearby (within walking distance) would be very nice
- A supermarket
- There is a lot nearby in terms of stores and services, but almost all too far to walk. A supermarket and drugstore nearby would already be super.
- An affordable supermarket and gym in the neighbourhood would be nice and a PLAYTUINTY. The Wadi in Vredeoord is always underwater, with no play equipment except a few wooden poles...
- Please, a supermarket and better bus service towards the central station, Woensel West and Eindhoven airport. The bus often drives by here now

- Would like some more green spaces, and more shops/restaurants etc. But for now, mainly a supermarket
- Especially a supermarket and drugstore are super annoying not to have nearby. On cycling, you can only take so much and if you forget something small, you're out of luck. You're faster at 3 coffee shops and the prostitutes than at the supermarket for a carton of milk or paracetamol....
- The supermarket is far away by cycling.
- A supermarket in/near Vredeoord/ new part Woensel west/barrier would be very desirable.
- A (commercial) supermarket is sorely missed in the neighbourhood. Too bad that talks with a franchisee for the "name expensive supermarket" continually break down, but then let another supermarket come in. The distance to the Jumbo Boschdijk is just too far if you live further back in the neighbourhood and need to do a lot/large groceries
- Supermarket, drugstore, bakery I find important
- Supermarket (and no to go or other small expensive ones) and drugstore within walking distance priority!!!
- A supermarket is especially desirable
- A supermarket within walking distance where you don't have to cross the ring road would be very nice
- There is a great need for a supermarket in the neighbourhood.
- It is quite sad that there is still no supermarket here in the neighbourhood. The only options are on Bosch Dijk, Judas Taddeusplein or in the WCW
- Especially missing stores in Woensel West such as drugstores, supermarkets, etc. And green spaces are fine, it's just a pity that they always become dog-walking areas or poo fields. Instead of grass, build gravel paths with plants, trees and benches.
- More green space and fine play areas where traffic is not too dangerous
- Again, a supermarket within walking distance such as the Albert Heijn or Lidl is very desirable!!!
- Supermarket, gym, drugstore and lunchroom or restaurant are desired
- Especially the supermarket is a big miss. Furthermore, a more frequent bus service would also be very nice. Good luck with your research, very nice that you are working on this!
- May fewer cars in the neighbourhood
- I miss most a good sports facility (gym) in the neighbourhood! Also, there is a huge waiting list at Korein so additional childcare is of course welcome!

Additional comments are not included in the table but offer additional insights

- An important amenity in Woensel that is very substandard is Strijp S station. Accessibility is very poor. I would like to take the train with our baby with the stroller and that is not possible there because of the lack of an elevator
- The quality/level of the playground does not always match (too much equipment for older age, not for toddlers/toddlers).
- It would be nice if there were more amenities for children and young children under the age of 4.
- Trudo’s retail strip on the Edison may be an even better addition. But there is currently a vacancy anyway and perhaps too many eateries and services in the retail spaces. That is also

less attractive than a nice mix of 6s and some food and beverage outlets. And as many 4in the neighbourhood as possible. Possibly more art, for example in the squares

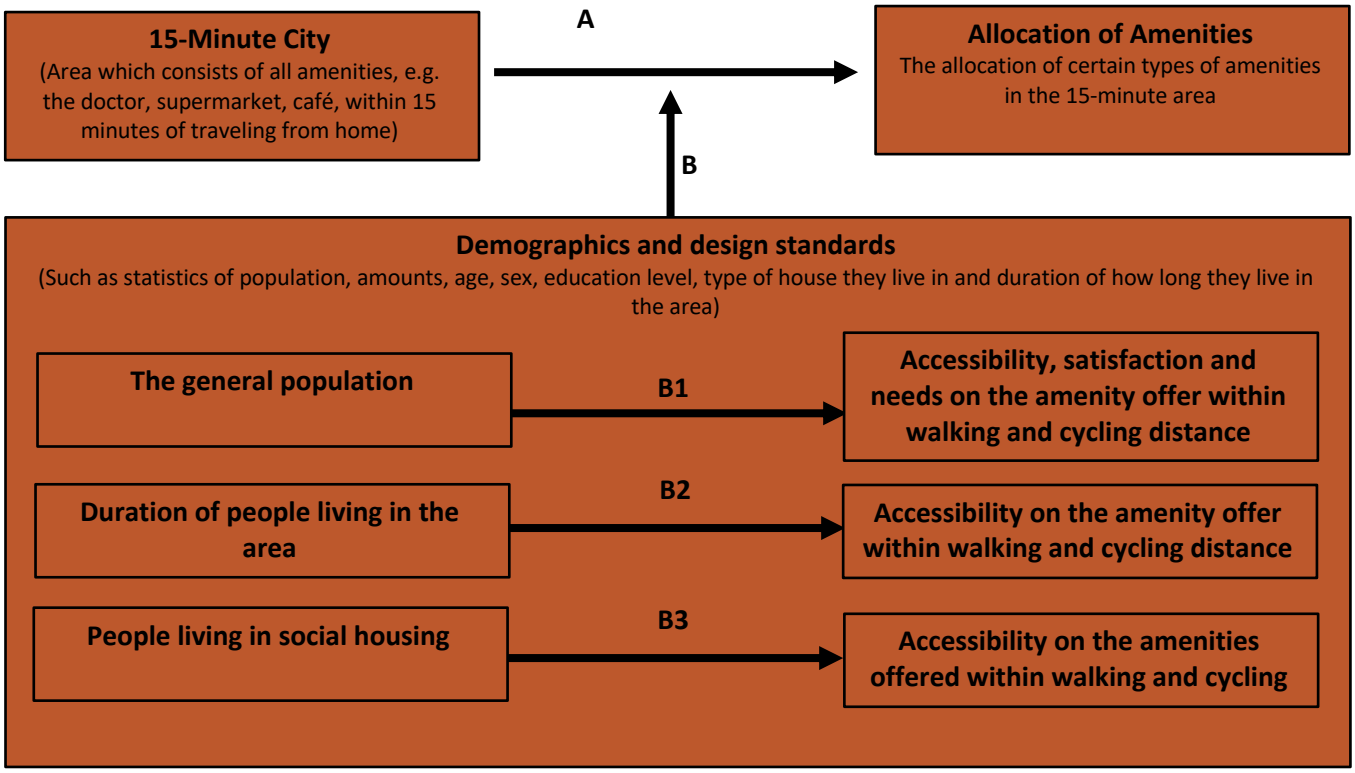
- The current business on Edison Street is required to be open more often. Most businesses are now only open two days a week. While other entrepreneurs are jumping for an opportunity here. And it would add a lot to the vibrancy of the neighbourhood. Especially Vensz, which is a prime location but never open.
- Together with *name primary school* and the VVE, we have been sitting around the table with representatives of the municipality to address the renovation of the schoolyard. Although this project needs to be restarted, the municipality does not seem to be very active in this. Perhaps a good thing to include?
- *Name social housing corporation* The retail strip on Edison may be an even better addition. But there is currently a vacancy anyway and perhaps too many eateries and services in the retail spaces. That is also less attractive than a nice mix of retail and some eating and drinking establishments. And as much green spaces in the neighbourhood as possible. Possibly more art, for example in the square seen
- Do something about the nuisance, from primary school, when dropping off and picking up children is antisocial parking, in the middle of the street, at intersections, on crosswalks, on sidewalks, on sidewalks in front of crosswalks etc

Appendix 10: Afterword and reflection

Overall, I liked the course of the thesis on average. I think I allocated my time efficiently and made good use of the resources within the time frame and opportunities to arrive at the final result. Looking at the process, the beginning was difficult.

This was because I found it difficult to find a topic, define an appropriate objective and then conceptualise the research. Once the conceptual model was worked out, the rest went smoothly as this made it possible to carry out the research and these points were finally clear to me. I am aware that I acted according to my knowledge and expertise in the best way possible at the time. One learns from experience and I learned a lot about creating a good scope and conceptual model. I found this very difficult because distinguishing between main and side issues can sometimes be difficult in a research setting. The formation of the scope also works out when forming a conceptual model, because at the beginning of this process, I wanted to include too many big concepts, which meant that the research was not concrete, small, or simple and I am now aware of this, also in the future. Thanks to this process, I have become better at this and will do it better in the future.

In addition, I have also become better at approaching people I don't know who might be important to the research, through introductions and interviews. Despite considering myself a social person and experiencing no difficulty in making contact, I can find this exciting in professional settings. However, by stepping outside my comfort zone, I have increased my comfort zone and no longer find it exciting and will find this easier in the future. based on the constructive criticism received, I had to work with SPSS which I have little experience with and had to act quickly within the frameworks because I had not considered in my planning that this step was necessary. As a result, in a very short time, I made a lot of contact with different people in my network and researched to understand what I needed to do in the right way and get back on track, looking back positively on this process and what I learned from it. The conceptual model from this feedback therefore changed to the following layout:



Furthermore, by having a tight schedule, the consistency to keep myself to this schedule, and the helpfulness and opportunities within the municipality and the university, there were a few moments where I struggled. However, working out the results took longer than I had planned, causing my schedule to slip, so I had to accept this, but it was for the better as the quality increased. I enjoyed the feedback moments from my professor through 'thesis-lab' meetings, where discussing the process with other students and getting feedback was very useful, instructive and fun. Also, the feedback I have received individually from my professor is very accurate, refreshing and educative. Without this feedback, the results and process would not have been the same as it is now and I am grateful for these moments. I am also very happy with the helpfulness of the colleagues and experts I spoke to within the Municipality, Woensel West and especially my internship supervisors for this opportunity.

Their time and interest in my topic and willingness to help think along and enrichments to make use of design standards, other useful data, or interesting people to talk to. This also helped me a lot with the process, the preparation of the research, the results and the reliability of the research. Once again, without the help I received, I could not have achieved the same results as how it is now.