Accessibility enhancement by the 15-minute city in Amsterdam Nieuw-West

To what extent is the 15-minute city concept able to enhance social sustainability?

TU Delft BK Bouwkunde
Department of Management in the Built Environment

Master's Thesis
Thijmen van Os
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Colophon

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Abstract: The 15-minute city is an urban planning concept which seeks to enhance social sustainability by improving accessibility. In this master thesis accessibility in Amsterdam Nieuw-West is explored to better understand the link between the 15-minute city concept and social sustainability to answer the research question: *To what extent is the 15-minute city able to enhance social sustainability?* Empirical research is conducted to identify the indicators that truly affect accessibility. Literature regarding the subject has pointed out two scale levels which affect accessibility. The macro scale relates to accessibility of the infrastructure network and availability of facilities while the micro scale relates to the indicators affecting the accessibility of a place. There where also two categories of accessibility indicators defined. Physical accessibility indicators experienced directly because of the built environment and social accessibility indicators experienced because of the behaviour of people inhabiting the built environment. This creates an interesting dynamic of the designed physical accessibility and the social accessibility resulting from it. After the initial literature review, three research methods were used in the case study in Amsterdam Nieuw-West. First two project mangers affiliated with the municipality were interviewed which alongside case study documents aided the framework of known accessibility indicators in Nieuw-West. Thereafter, the way accessibility is experienced was studied on both scale levels. The macro scale by interviewing residents about their decision making process regarding their routes and destinations utilising mental maps and the micro scale by street interviews with users of Osdorpplein. The findings show that the 15-minute city concept is not applicable as a one size fits all solution for urban development as that would be discriminatory because of the different desires and capabilities of inhabitants. However, indicators of the 15-minute city on their own are able to improve accessibility and thus social sustainability.

Key words: Accessibility indicators, Physical accessibility, Social accessibility, x-minute city, city of proximities, walkability, factors affecting accessibility

Preface

Before you lies my Master Thesis:
Accessibility enhancement by the 15-minute city in Amsterdam Nieuw-West.

In this research I elaborated on the understanding of accessibility in urban areas to evaluate the impact of the application of the 15-minute city concept on social sustainability. I approached this from the perspective of spatial justice which advocates an equal right to the city for all its inhabitants. This thesis is written to finalise my studies at the TU Delft and complete the master track: Management in the Built Environment. The full process of this thesis took the whole academic year starting with the conceptualisation of the subject in September of 2022 and concluding with the final presentation, P5, in June of 2023.

During my studies at the TU Delft I realised that I had a fascination for public space and the way we design and use our cities. This interest further developed during my internship at the project management team of the municipality of Amsterdam in which we took a closer look at the design of greenery and its usage in Amsterdam Nieuw-West. During this time, I also developed interest in human centric city design, partly because of the internet and countless examples car-centric city design, which I despise. This made researching the 15-minute city, social sustainability and accessibility in particular all the more interesting which did become the main subjects for my research.

I would like to thank Ellen Geurts and Aksel Ersoy for their guidance during the process. Which includes the feedback received and the steering of the process. Especially Ellen was very helpful in making sure that I was on the right track and put in the right effort when necessary. Next I would like to thank the participants of the interviews and especially the Van Eesterenmuseum which was kind enough to bring me into contact with fellow interested people wanting to voice their opinions on the accessibility of Amsterdam Nieuw-West.

At last, I would like to thank my family, friends and fellow graduates for their continuous support, which ranged from testing out interviews questions to offering a listening ear for when I needed extra support

I wish you a pleasant read.

Sincerely,

Thijmen van Os

Leiden
June, 2023

Summary

Social sustainability is becoming more and more of a concern as more people around the world move from rural areas to urban environments. Social sustainability relates to the quality of life (Chiu, 2004). Social sustainability in an urban context is affected by spatial justice, or a right to the city (Harvey, 2008). An urban design concept which aims to enhance social sustainability is the 15-minute city as conceptualised by Monero (2016). It aims to enhance social sustainability thought the improvement of accessibility by increasing proximity to the necessities of the city, living, working, commerce, healthcare, education and entertainment, so that they can be reached within 15 minutes of bicycle riding or walking.

Multiple cities around the world, including ones in the Netherlands are implementing indicators of the 15-minute city which begs the question wether the 15-minute city is the one size fits all solution towards social sustainability which it profiliates to be. This notion is questioned in this research as the hypothesis of this research is that the 15-minute city as a whole is not a perfect solution to enhance social sustainability as the needs and desires of inhabitants are too complex for one solution. That is why this research delves into the indicators of accessibility to then evaluate to which extent the 15-minute city concept influences them. This way the research was able to answer the main research question: *To what extent is the 15-minute city able to enhance social sustainability?*

The three main concepts studied in this research are social sustainability, the 15-minute city and accessibility. These concepts are all included in the literature review but mainly accessibility is further studied in the empirical study of this research utilising a case study in Amsterdam Nieuw-West. The indicators of social sustainability in an urban context are differentiated between indicators originating from people versus indicators originating from the built environment (Shirazi & Keivani, 2018). The soft infrastructure includes for example feeling of safety, sense of attachment and social networking and interactions. The hard infrastructure is affected by for example access to facilities, building typology and density. Social sustainability indicators have some overlap with accessibility which is also split up in social and physical indicators. These indicators are found on two scale levels, the macro and micro level where the macro level relates to the access to a place affected by the availability of facilities and the micro level relates to the access of a place affected by more concrete indicators like the presence of greenery, enclosure, feeling of safety and visual richness. The 15-minute city aims to improve accessibility by indicators like removing car traffic from cities, increase greenery and mixed use spaces which sees optimal usage of the space available in existing cities.

During the empirical research focussed on accessibility, multiple research methods were utilised. First case study documents were analysed followed up by interviews with project managers which provided the accessibility experience of users as perceived by functionaries. Secondly, interviews were conducted directly with the users on both the macro and micro scale levels. The interviews with residents on the macro scale made use of mental maps which proved useful in uncovering the decision making process people make when accessing destinations. The micro scale of accessibility was studied with street interviews at Osdorpplein with residents which gave honest insight in which indicators of accessibility users of the public space do and do not experience regarding accessibility.

The study into the case study documents and interviews with project mangers of Nieuw-West showed that Nieuw-West could be considered a 15-minute city already as most of the necessities of the city can be reached within 15-minutes of walking or cycling. The interviews with residents confirm this as the note that the quality of the bicycle infrastructure in Nieuw-West is an important indicator which makes cycling to their destinations comfortable. The project managers also note the impact car usage has on accessibility. Residents note that they enjoy bicycle paths separated from car traffic and through greenery. The 15-minute city concept also advocates for no car traffic within cities as it improves accessibility for other modes of transportation. This notion is supported by the municipality. However, multiple residents and passers-by at Osdorpplein have noted the need for transport by car in the city because of personal circumstances or physical capabilities. Users and functionaries of the municipality both note they need for a clear an logical design of the built environment. A built environment which is designed clear in nature and in purpose, provides the users with comfort as they benefit from simple urban design. When the urban design is messy or unclear, people can feel lost. The empirical study has also pointed out the issues relating to social cohesion and identity of an area. Different demographics inhabiting different areas cause a different identity to take shape which improves the accessibility experience for some but worsens it for others.

The findings suggest that indicators of the 15-minute city are able to improve social sustainability but that the 15-minute city concept as a whole will negatively affect social sustainability. This is based on the complex and diverse wishes, needs and capabilities of the residents. As shown in the findings, not accommodating to car traffic in the city excludes participation to some inhabitants as it is their only reasonable mode of transport in some instances. Certain demographics would be homestuck if their car travel would be taken away which goes against the concept of spatial justice and thus social sustainability. Another finding which conflicts with the 15-minute concept is the identity preference. The 15-minute city sees the city become one entity of mixed use spaces. By only accommodating for people in the city who thrive in the complexity of mixed use spaces, people who enjoy relative quiet neighbourhoods in cities are excluded from participating. by implementing the 15-minute city, one specific part of an identity related to spatial planning is forced upon inhabitants which does discriminate against people not desiring to conform to that identity. So in conclusion, these findings show that the 15-minute city will worsen social sustainability to a certain extent rather than improve it while careful partial implementation of its indicators can enhance it.

This research has shown the complex nature of accessibility and limitations of the 15-minute city in its aim to enhance social sustainability. In terms of research methods, this research has proven that direct approaches in empirical research focussed on experiences could be best approached trough direct involvement of the user. This is proven by a small but significant disconnect between the data gathered from the functionaries describing the perceived accessibility experience of the user and the data gathered from asking the users directly. Further research could be conducted increasing the scope of the research by increasing the amount of interviews and case studies which will increase the study's transferability.

Table of contents

Preface **3**
Summary **4**
Table of contents **6**
Chapter 1: Introduction **8**
1.1 Background 8
1.2 Problem statement 8
1.3 Research questions 9
1.4 Thesis set up, a Case study in Amsterdam Nieuw-West and Osdorpplein 10
1.5 Relevance 11
1.5.1 Academic relevance 11
1.5.2 Societal relevance 11
1.6 Research output 11
Chapter 2: Literature background **12**
2.1 Social sustainability 12
2.1.1 Social sustainability definition 12
2.1.2 Indicators of social sustainability 13
2.2 Accessibility 17
2.2.1 Accessibility perspective of two scales 17
2.2.2 Two categories of indicators of accessibility 19
2.3 The 15-minute city concept 23
2.3.1 Non 15-minute cities 24
2.3.2 Decentralisation 25
2.3.3 Traffic replacement 26
2.3.4 Ecology enhancement 27
2.3.5 Multipurpose usage 28
2.3.6 Challenges of the 15-minute city 29
2.3.7 Indicators of the 15-minute city 30
2.4 Conceptual model 31
Chapter 3: Research method **32**
3.1 Research purpose 32
3.2 Type of study 32
3.3 Research strategy 33
3.4 Data collection method 34
3.4.1 Interviews with project managers 34
3.4.2 Interviews with residents using mental maps 34
3.4.3 Interviews with passers-by in Osdorpplein 35
3.5 Data plan 36
3.6 Data analysis in qualitative research 37
3.6.1 Credibility 37
3.6.2 Transferability 37
3.6.3 Dependability 38
3.6.4 Confirmability 38

3.7 Ethical considerations 39
3.8 Operationalisation 39
3.8.1 Interviews with project managers 39
3.8.2 Interviews with residents 40
3.8.3 Interviews with passers-by in Osdorpplein 40
Chapter 4: Results 41
4.1 Urban design of Amsterdam Nieuw-West 41
4.1.1 History of spatial planning in Nieuw-West 41
4.1.2 Municipal vision on Nieuw West 43
4.1.3 The municipal vision regarding mobility in Nieuw-West 43
4.1.4 Is Amsterdam Nieuw-West a 15-minute city according to the municipality 46
4.1.5 The urban fabric and accessibility in Nieuw-West by the municipality 47
4.1.6 The impact on social mix by the municipality 50
4.2 Amsterdam Nieuw-West Experienced 50
4.2.1 Transportation in Nieuw-West 51
4.2.2 Routing 53
4.3 Osdorpplein designed 53
4.3.1 Development history of Osdorpplein 54
4.4 Osdorpplein experienced 56
Chapter 5: Discussion 61
Chapter 6: Conclusion and recommendations 65
6.1 Conclusion 65
6.2 Recommendations 65
Reference list 67
Appendix I: Reflection 75
Appendix II: Operations table of the research 78
Appendix III: Interview subjects project managers 79
Appendix IV: Interview questions residents of Nieuw-West 80
Appendix IV: Interview questions users of Osdorpplein 85

Chapter 1: Introduction

1.1 Background

The increasing number of urban dwellers around the world is at an all time high and it shows no sign of slowing down any time soon. The shift from the countryside to urban areas is visible around the globe which incentivises policymakers to be critical of the sustainability of our cities. The United Nations (UN) notes that in addition to the more well-known environmental sustainability concerns, social sustainability issues related to the expanding cities should also not be undervalued and should become a driver for (re)designing cities. Social sustainability has become an integral part of the urban agenda to align social needs and urban development (Sugandha, Freestone & Favoro, 2022). Over the years general understanding and consensus regarding social sustainability in an urban context has evolved. From one of its first notions, that the long-term survival of livable urban units is what urban social sustainability is all about, by Yiftachel and Hedgcock (1993). To a more human focussed approach that social sustainability is about the enhancement of life conditions within communities by McKenzie (2004). After which social sustainability was finally viewed as a value, where socially sustainable neighbourhoods are highly valued because of their qualities and where inhabitants are able to participate in them together (Shirazi & Keivani, 2018). This understanding links back to the understanding that social sustainability is about the maintenance or improvement of the well-being of people and thus their quality of life (Chiu, 2004). In addition, one of the fundamental requirements for social sustainability is spatial justice and a right to the city, where all inhabitants can participate and take share in the cities resources (Harvey, 2008) Carlos Monero (2016) suggests the 15-minute city concept as a way to improve quality of life and thus social sustainability in urban environments. The 15-minute city is an urban planning concept which sees all the necessities of the city provided within a 15-minute walk or bicycle ride for its residents. This concept enhances social sustainability because quality of life is enhanced by being able to utilise the six functions of the city: living, working, commerce, healthcare, education and entertainment without the need for long commutes according to Monero (2016). It also partly tackles the environmental sustainability issue by reducing the general need for car traffic in cities. So the aim of the 15-minute city is to enhance social sustainability by enhancing accessibility for bicycle and pedestrian movement. This human focussed approach to the design of the city is the most influential factor increasing quality of life for its residents (Logan, et. al., 2022). Multiple cities around the world, including cities in the Netherlands, are implementing ideas of the 15-minute city as they are realising its potential to improve environmental, and more interestingly, social sustainability.

1.2 Problem statement

The 15-minute city aims to enhance social sustainability by enhancing accessibility. “Accessibility reflects the ability to reach frequently visited places efficiently and conveniently” (Cheng, Bertolini & Le Clercq, 2007, p.17). Fundamentally, accessibility can be enhanced by bringing frequently visited places closer together or increasing travel speed to those places. This, however, is a narrow-minded view of accessibility, not indicating the fact that accessibility is more complicated than just proximity and travel speed. Monero (2021) aims to disprove the idea that accessibility can be improved by accelerating travel.

Increasing travel speed and thus relying more on cars has been the general consensus for the past century which created car dependent cities in which people are forced to commute a long distance to access their necessities. Monero (2021) therefore advocates for the 15-minute city. In which time saving through proximity instead of faster movement is the main goal which should make cities more accessible. However, as just mentioned and the literature points out, that way of accessibility is limited in the sense that accessibility is denoted to just the time and distance it takes to get to a destination. A 15-minute city can still feel inaccessible as there are a plethora of factors influencing the experience of accessing its functions. For example, next to the commuting time and distance, the route can feel unsafe, or the unmaintained infrastructure can make the route by bike uncomfortable. These factors limit accessibility even though they do not necessarily affect distance or commuting time. Literature already provides ample factors impacting accessibility next to distance and travel time. The full 15-minute city concept as proposed by Monero (2021) does include more interventions than just increasing proximity which allows it to improve accessibility in more ways than just fundamentally on distance and time spend commuting.

The 15-minute city concept is being proposed as an utopia in which the accessibility of all inhabitants will be enhanced which improves social sustainability for all residents. However, this research poses the question whether this urban concept is able to fulfil that promise, taking different demographics and accessibility influencing factors into account as the right to city for all its inhabitants is taken into question. The hypothesis of this research is that the 15-minute city concept is not able to enhance social sustainability for all inhabitants of the city as it crucially affects accessibility. This is based on the complexity of accessibility and the different needs and wishes of the different demographics of inhabitants living in the city.

Accessibility, and especially accessibility of different demographics, is a complex issue. This based on the fact that most research aimed at accessibility of urban areas rarely takes more than physical accessibility into account. Accessibility in research is often primarily focussed on aspects of the built environment like street width, adequate wheelchair ramps and urban fabric. This focus on the built environment leaves out the important factor caused by the people inhabiting it. People inhabiting the built environment influence accessibility factors of others with their behaviour. This research categorises this as social accessibility. Indicators of social accessibility are caused by peoples behaviour like: feeling of safety, litter and filth on the streets but also more broader concepts like urban vitality and social cohesion. Because the understanding of accessibility is limited, also in terms of physical accessibility, it is difficult to grasp to what extent the 15-minute city is able to enhance social sustainability. So to understand that, there first needs to be a better understanding of what factors affect accessibility.

1.3 Research questions

In order to determine to what extent the 15-minute city concept is able to improve accessibility and thus enhance social sustainability, it is necessary to first explore what social sustainability means in an urban context through a literature review. Then the 15-minute city is further explored, what it means and what its implementation entails also using a literature review. But most importantly, the indicators that affect accessibility need to be better understood through a literature review and empirical research with a case study in Amsterdam Nieuw-West. So the goal of this research is to better understand the factors

affecting accessibility to then gauge the impact of the implementation of the 15-minute city on them to judge to what extent its implementation is able to enhance social sustainability. The case study in Nieuw-West is conducted utilising case study documents, interviews with project managers, interviews with residents and street interviews with passers-by at Osdorpplein. This has lead to the following research questions.

- *MRQ: To what extent is the 15-minute city able to enhance social sustainability? (by enhancing accessibility)*

- *SQ1: What is social sustainability in an urban context?*
- *SQ2: What are the indicators of a 15-minute city and accessibility?*
- *SQ3: To what extent is the municipality of Amsterdam enhancing accessibility in Nieuw-West?*
- *SQ4: To what extent is accessibility experienced by the residents of Amsterdam Nieuw-West?*

1.4 Thesis set up, a Case study in Amsterdam Nieuw-West and Osdorpplein

As mentioned before, for this empirical research, a case study was conducted to uncover the experienced factors affecting accessibility. The reasoning behind this is further elaborated upon in chapter 3 of this thesis but an introduction is provided here. The study dives into a underdeveloped concept, so it requires explorative research and has used qualitative methods. The context of the built environment affects accessibility so it is relevant to the study as they are experienced by residents in that context. Because of this, a case study was chosen. The literature, as elaborated upon in chapter 2, has shown that there are 2 scale levels on which accessibility can be studied. The macro and micro scale. The macro scale focuses more on routes, reach and availability of amenities while the micro scale focuses more on the experience of accessibility of a place. For the macro scale, Amsterdam Nieuw-West was chosen because of the municipalities elaborated development plans related to accessibility next to personal ties of the researcher. The micro scale was chosen to be analysed in Osdorpplein as on first glance, it is a vital urban area which suggests it includes a lot of accessibility enhancing factors. It is also home to a lot of people with arabic heritage next to people with a dutch heritage which made it easy to gather data from different perspectives (Allecijfers, 2023).The municipality's input is first described because it sets the scene for the accessibility design in Nieuw-West. Then residents on the macro scale and users on the micro scale were asked about their accessibility experience. Hereafter follows a discussion comparing the literature regarding accessibility with the the designed accessibility and the experienced accessibility. Afterwards the conclusion is drawn regarding the limits of accessibility by the 15-minute city to answer to what extent it is able to enhance social sustainability.

1.5 Relevance

1.5.1 Academic relevance

The goal of this research is to identify the indicators truly affecting accessibility. This goal is attained by triangulating data from a literature study, a case study and interviews. In this study the differentiation was found between physical and social factors affecting accessibility which provided a new perspective on accessibility. Also the understanding of how the 15-minute city is linked to social sustainability is developed further which does push research into these topics into the right direction. However, the insights gathered during this study are not developed far enough to realistically say that they will add to the academic debate which is due to the practical limits of the research and qualification of the researcher.

1.5.2 Societal relevance

The societal relevance of this research is greater than its academic relevance as the research methods used for empirical research in this study are quite underused by policy makers and did prove useful during this study. Accessibility was studied in the case study of Amsterdam Nieuw-West on two scale levels for which two different kinds of interviews were conducted. The macro scale of accessibility was researched using mental maps which proved very useful in the in-depth interviews with residents. It allowed for residents to become conscious about the decisions they make when traversing the built environment. It uncovered the factors affecting their accessibility on the macro and micro scale which influence them in their decision making process as an user of the infrastructure. The user experience was also studied on the micro scale in Osdorpplein where on the street interviews were conducted with passers-by. This is a vastly different approach to experience based research than policy makers currently conduct as the most common way of researching concepts like accessibility and social sustainability in an area is to study them from the perspective of the person in function. Say it be a researcher or a policy maker themself. Vastly different results are found when researching the experience of the user instead of the experience of a person in function as a user. This research proved that this way of literally asking about the experience of the user provides a more honest insight in how spaces and areas are experienced in comparison to the method current policy makers are using.

1.6 Research output

The goals and objectives of this research are to gain a better understanding of accessibility in an urban context and by that the impact of the 15-minute city on social sustainability. This understanding is studied using a relatively underused research method in practice which is further elaborated upon in chapter 3. This research method proved very useful for conducting empirical research aimed to end user experiences which signifies that this method could be utilised by fellow researchers and policy makers in further research. The knowledge gathered in this research is presented in this thesis and its summary which are findable in the online repository of the TU Delft. Its main audiences are the tutors which have supervised this research and the delegate of the TU Delft. Others in the audience are friends, family and fellow students and a separate presentation at the Van Eesterenmuseum in Amsterdam Nieuw-West.

Chapter 2: Literature background

In this chapter the literature background is presented in which the three main concepts of this research are explored: social sustainability, accessibility and the 15-minute city. Social sustainability is examined in an urban context. Accessibility is first discussed containing in two scales to analyse it after which the two categories of accessibility indicators are discussed. Then, the 15-minute city is explored in a structure that follows the change from a non-15-minute city to a 15-minute city.

2.1 Social sustainability

This research looks into the link between the social concept of social sustainability and the 15-minute city in terms of the built environment to answer *SQ1: What is social sustainability in an urban context?* It is therefore important to define what social sustainability is and then how social sustainability is linked to the built environment.

2.1.1 Social sustainability definition

According to the United Nations Global Compact (2023) it “is about identifying and managing business impacts, both positive and negative on people”. They make clear that social sustainability is first and foremost about people. This is its defining factor in the whole umbrella term of sustainability as can be seen in figure 1 where the four dimensions of sustainable development are presented: natural, political, economic and social.

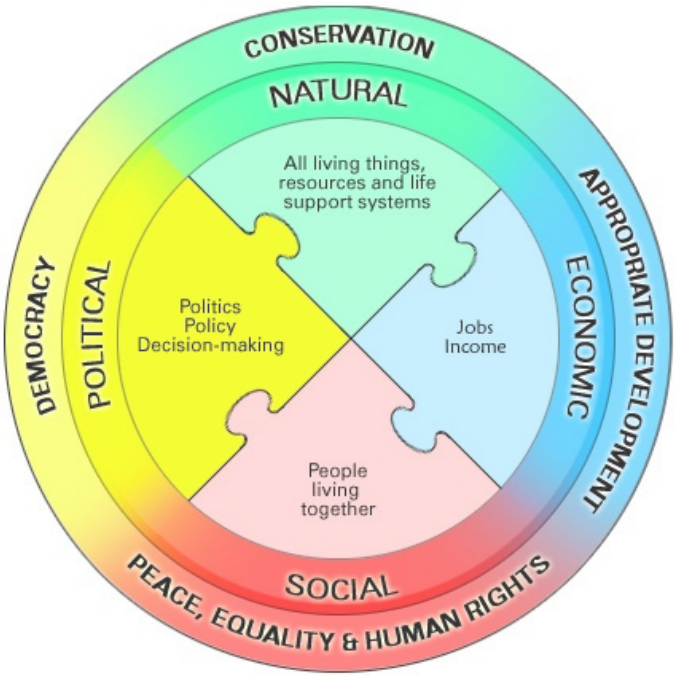


Figure 1, UNESCO four dimensions of sustainable development (UNESCO, 2010)

As the figure shows, the social dimension is about people living together. This is the first link to the built environment required for this research. The UN Global Compact (2023) has human rights as its cornerstone for social sustainability. Which is the fundament of social sustainability but less relevant for this research. The context of the 15-minute city and

accessibility is based on the precondition that basic human needs like food and water, but also basic housing needs like adequate space, privacy, structural integrity, protection from the elements, cleanness, etc. are met. From that baseline it is possible to look further into enhancing social sustainability.

Chiu (2004) presents three interpretations of social sustainability. The first by Munro (1995) sees social sustainability, just like environmental sustainability, as a constraint on development. This interpretation is in line with the definition of the UN (2023) as it sees a negative impact on social sustainability as a limiting factor on development. The second interpretation by Mitlin and Satterthwaite (1996:25) see social sustainability as a precondition for environmental sustainability where the social conditions relating to values, rules and lifestyles influence the environmental sustainability of resource and asset allocation. The final interpretation views social sustainability improvement as a potential standalone objective. Social sustainability is about the maintenance or improvement of the well-being of people and thus their quality of life (Chiu, 2004). The goal of this research is to explore the link of accessibility between the 15-minute city and social sustainability. This last definition fits with the goal of exploring to what extent the 15-minute city can enhance well-being and thus social sustainability by improving accessibility. It also correlates with the definition of McKenzie (2004, p.23) “Social Sustainability is: a positive condition within communities, and a process within communities that can achieve that condition”, which takes a step further than the interpretation of Chiu, (2004) and specifies that social sustainability is a condition found in communities of people. This brings the definition to a neighbourhood level.

2.1.2 Indicators of social sustainability

Shirazi & Keivani (2018) note that social sustainability on a neighbourhood level is a two-fold concept with both ‘soft’ and ‘hard’ qualities which they call soft and hard infrastructure. The soft infrastructure relates to the social practices and social qualities that are experienced and conducted. The hard infrastructure relates to the urban context, the built environment and physical qualities in which the soft infrastructure exists. This means that in socially sustainable neighbourhoods both the physical and social qualities are conceptualised and perceived as being of high quality (Shirazi & Keivani, 2018). The notion of quality is subjective and can be attributed to someone's characteristics, their profile. This is next to the soft and hard infrastructure, the third factor influencing the level of social sustainability. Based on these three factors, Shirazi & Keivani (2018) present the triad of social sustainability which contains the three integral pillars: neighbour, neighbouring and neighbourhood, see figure 2.

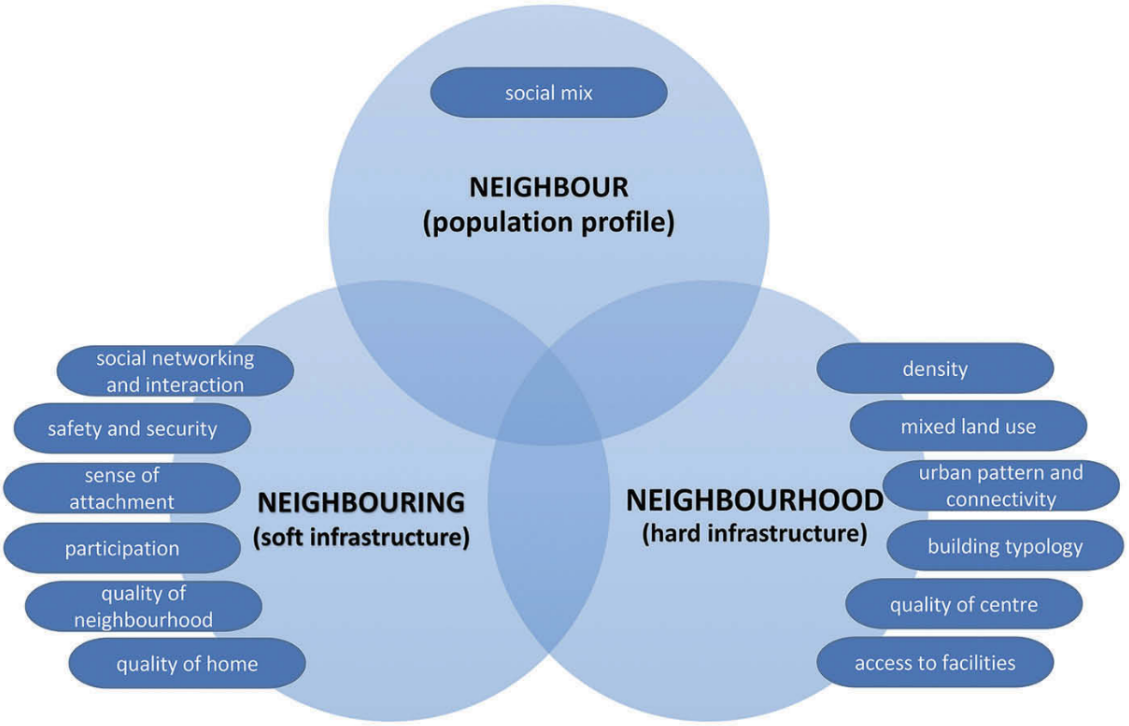


Figure 2, Triad of social sustainability of urban neighbourhoods, pillars, and indicators. (Shirazi & Keivani, 2018)

This figure suggests that measuring the social sustainability of a neighbourhood should include these three pillars and its measurable indicators. Table 1 shows a comprehensive list on how each of these indicators can positively affect social sustainability.

Table 1, Indicators of social sustainability and their positive influence (2023, authour)

Hard Indicator	**Positive influence on social sustainability**
Density	A high density, people/km², may be desirable because it can decrease the amount of resources necessary to service residents. It may also enhance social sustainability on the condition that the built form, layout, design, minimum standard of living space and culturally acceptable amount of mix of uses are consciously linked (Dave, 2010). Optimal density is subjective as people evaluate their neighbourhood based on the quality and availability of amenities, not on the density of the neighbourhood itself (TCPA, 2003). Also, a too high density may also lead to a loss of social cohesion (Mouratidis & Poortinga, 2020). So an optimal density for social sustainability is based on context and the capacity of services and amenities.
Mixed land use	Mixed land use in terms of implementing multiple functions in one place has been proven to enhance social sustainability through a higher quality of life perception and feeling of security (Elkin, McLaren, & Hillman Citation, 1991) Mixed land use increases proximity to everyday amenities which improves quality of life for communities and thus social sustainability as well (Monero, 2021)

Urban pattern and connectivity	A key aspect of the urban pattern is the street network as it influences connectivity, integration and permeability of spaces (Shirazi & Keivani, 2018). Connected and permeable spaces which facilitate walking are shown to improves a feeling of safety, psychological and physical health (Foster, Giles-Corti, & Knuiman, 2010).
Building typology	Building typology has a clear impact on social sustainability as it determines the density, the openness and general attractiveness of the houses. High rise allows for high density which allows for proximity to services and amenities while single family homes often do not (Warr et al., 2007). However single family homes are still generally the most preferable form of housing (Appold & Yuen, 2007) probably because high rise is often less satisfactory than other housing forms because they are suboptimal for children, social relations are more impersonal, fear of crime is greater (Cifford, 2007).
Quality of centre	The quality of the centre on a neighbourhood scale relates to the quality of the centre of the community (Shirazi & Keivani, 2018). The centre of a community can be a square, a local green space or even a religious building or a community complex. Studies note that a high-quality communal centre acting as a focal point improves the wellbeing of local residents (Francis et. al. 2012). It is also shown that there is a positive relation between having an open space in neighbourhoods and positive relations with neighbours, decreased violence and increased housing satisfaction (Karuppannan and Sivam, 2011). The quality of such a centre is affected by a plethora of factors including but not limited to: environmental qualities like green space and cleanness, spatial qualities like aesthetics and enclosure, social qualities like socialising patterns and collective activities and infrastructure like the street furniture and facilities (Shirazi & Keivani, 2018).
Access to facilities	Shirazi & Keivani (2018) argue that accessibility to facilities is a key indicator of social sustainability. In their terms, accessibility to facilities consists of two parts: availability of needed key amenities on the neighbourhood level and physical access to them. Walkability of facilities is an indicator of social sustainability (Talen, 2003) and evenly spread out facilities which provide equal access further enhance social sustainability through social equity and urban justice (Tsou,Hung, and Chang2005). Accessibility is an integral part of this specific research and is thus further explored later in this chapter.
Soft Indicator	**Positive influence on social sustainability**
Social networking and interactions	Social interactions in the neighbourhood lead to a social network between residents. A strong social network is shown to benefit quality of life and thus social sustainability (Kavanaugh et al.2005). This social network is measured based on for example the frequency of meeting neighbours, help and support from neighbours, etc. (Shirazi & Keivani, 2018). A strong social network is also referred to as social cohesion which is “the extent of connectedness and solidarity among groups in society” (Kawachi & Berkman, 2000 p.175)

Safety and security	A feeling of safety and security contributes to quality of life and makes places attractive to live (Brounen, Cox & Neuteboom, 2012). Safety and security relates to safety from accidents mostly related to traffic, motor vehicles in particular (Bennett et al. 2007). But also to crime, fear of crime and harassment (Foster, Giles-Corti & Knuiman, 2010).
Sense of attachment	A sense of attachment is a 2 fold concept (Shirazi & Keivani, 2018). Attachment in a neighbourhood context can be attributed to the built environment and to its residents. Personal attachments to elements or qualities in the build environment and connection with communities or community members (Rogers & Sukolratanametee, 2009). Sense of attachment in both situations can lead to a multitude of social advantages. People with a sense of attachment are more likely to maintain the quality of that place, maintain long-term relations with neighbours and experience an improved wellbeing (Comstock et al,. 2010)(Mesch & Manor, 1998)(Kafetsios & Sideridis, 2006).
participation	Participation in a neighbourhood indicates the level of commitment and interest residents feel towards their neighbourhood in terms of dealing with problems and plans (Michels & De Graaf, 2010). This way it is an indicator of existing social sustainability but it can also enhance social sustainability on its own as community participation increases social capital and vibrancy of the community (Teernstra & Pinkster, 2016)(Putnam, 2000)
Quality of neighbourhood	The quality of the neighbourhood is about satisfaction with the qualities that the neighbourhood provides. This includes a plethora of factors, including but not limited to: architectural character, landscaping and cleanness. These factors affect the perception of the quality of the neighbourhood for the resident (Lee et al. 2016). This all builds up to an improvement of neighbourhood satisfaction which enhances the social features like for example safety and security (Sirgy & Cornwell, 2002)(Austin et al. 2002).
Quality of home	The quality of home does not relate to the non physical qualities of the residents home but rather to the positive psychological association to it (Barreira et al., 2016) These positive associations can come from, things such as privacy, noise, and green space in the residents vicinity or home itself (Byun & Ha, 2016)
Population profile	**Positive influence on social sustainability**
Social mix	Social mix is a stand alone pillar in the triad of sustainability and relates to the personal profile of the resident. (Shirazi & Keivani, 2018) It is determined by the diversity of the residents of the neighbourhood in terms of for example: social status, race, age, gender and education level. This relates to social cohesion which will be discussed later.

2.2 Accessibility

The improvement of accessibility is the main factor which the 15-minute city concept employs to enhance social sustainability. As is elaborated upon further down in this chapter, the improvement of accessibility by the 15-minute city concept is mostly attributed to the increase of proximity within cities which should result in all the necessities of the city being accessible within 15-minutes of walking or cycling. This subchapter answers *SQ2: What are the indicators of a 15-minute city and accessibility?* with first accessibility being discussed and then what the 15-minute city concept entails to add to that concept. It has to be noted that accessibility is a broad concept. Accessibility in this research is related to access in a spatial context. However, access to a space is influenced by personal accessibility factors as well which are solely related to the person judging the accessibility. This includes access to modes of transport for example which is influenced by the personal situation of the of the user. This chapter and most of this research views accessibility as access of spaces in an urban context while being aware of the influence personal accessibility has on them.

2.2.1 Accessibility perspective of two scales

According to Batty (2009 p. 191): accessibility in a spatial context “is often seen as a measure of the cost of getting from one place to another, traded off against the benefits received once the place is reached.” It “reflects the ability to reach frequently visited places efficiently and conveniently” (Cheng, Bertolini & Le Clercq, 2007). The ability to reach these places is determined by the trade-off of costs and benefits perceived when accessing a place. Perception is a key factor in determining accessibility. Perception of accessibility is a personal experience. Different people experience different costs and benefits, or hindrances and qualities when accessing their frequently visited places. This research studies the extent to which the 15-minute city is able to enhance social sustainability and for that accessibility as a concept has to be understood. As just mentioned, accessibility is experienced by people while its indicators are presented by spaces and situations. The way these indicators are experienced according to literature is discussed here. But before that, the two scales on which accessibility can be examined are clarified. These two scales, or levels, are the macro and micro scale as presented by Mitropoulos et al. (2023) Cui et al. (2020) note that it would be a necessity to measure and illustrate accessibility in both the macro and micro scale for urban areas.

Quantification and measurement of accessibility on the macro scale commonly focuses on two things (Mitropoulos et al., 2023). The reach of a transportation network of an area and the potential of opportunities available within that area for an individual or group of people. Measuring the transportation network or infrastructure to asses accessibility is used to determine the distance or area someone can cover from a specified point. After these boundaries have been determined the accessibility of an area can be measured on the basis sum of population, points of interest and total area that it services, the cumulative approach. This is best used for measuring the accessibility of a network as it shows the accessibility of a network an in area. Figure 3 illustrates an example of the cumulative method being used to determine the accessibility of workplaces by public transport. The second method, based on gravity or entropy models, determines the spatial accessibility based on the potential of opportunities within an area to a group of people (Mitropoulos et al., 2023). This measures the accessibility of an area based on a opportunity like for example healthcare (Yang et al.,

2006). The distance and availability of those opportunities determines the spatial accessibility of an opportunity in that area. Figure 4 illustrates an example of the gravity method which determines spatial accessibility based on the availability of primary health care clinics in an area.

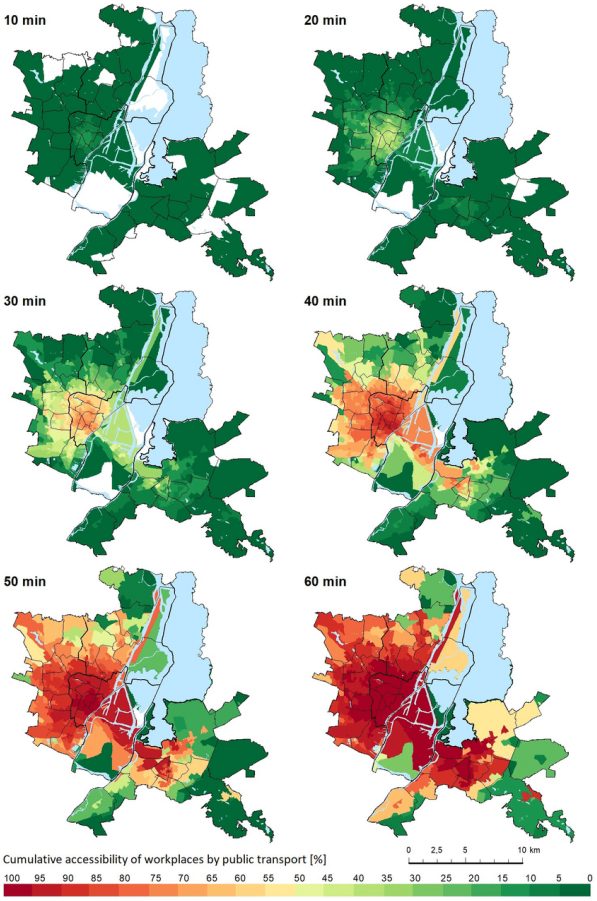


Figure 3, Example of accessibility measured via the cumulative method (Goliszek et al., 2020)

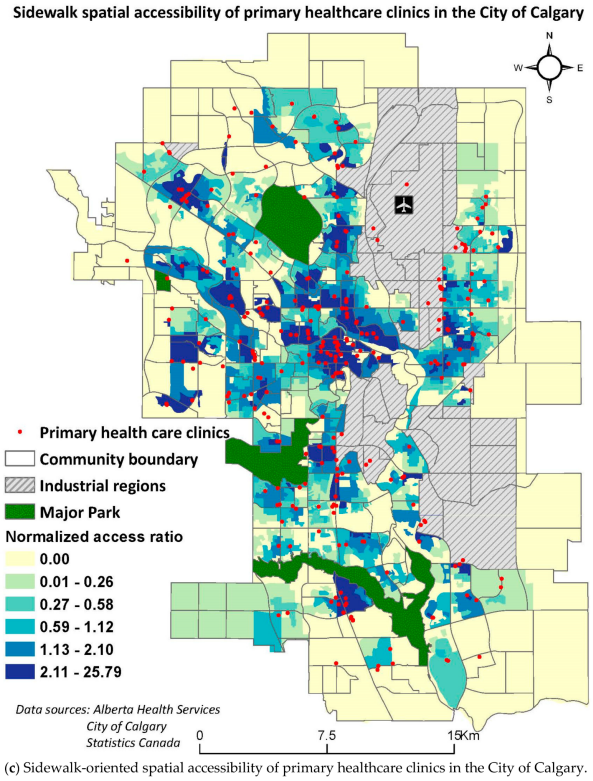


Figure 4, Example of accessibility measured via the gravity method (Khakh et al., 2019)

How macroscale models focussed on transportation networks and large areas, the microscale focuses on the scale of walking and cycling. These models are suitable for for example assessing the accessibility of a road section (Mitropoulos et al., 2023). The accessibility of small scale areas are often measured relating to the concept of walkability and later cyclability as they are the measured accessibility by foot and bicycle respectively. Walkability can be determined by two indicators. The amount of pedestrians and the walkability index (Kalfa, 2015). The amount of pedestrians reflects the flows of people and signifies the use of an area while the walkability index is based on factors like: population density, sidewalk network connectivity, infrastructure data and quality and route signage (Mitropoulos et al., 2023). The walkability index by Bartzokas-Tsiompras and Photis (2020) expands on these indicators by integrating the residential density, land use mix and land use proximity. Walkability in urban environments is also greatly influenced by the physical aspects of the built environment by factors like enclosure, block length and edge conditions (Singh, 2016). Cyclability is quite a new approach to assessing accessibility (Mitropoulos et al., 2023). It is closely related to walkability but does include different parameters: cycling

infrastructure, cycling crossings, obstructions and barriers, safety issues, traffic signalling and connections to points of interest. (Ros-McDonnell et. al., 2020) Bielik et. al. (2018) argue that access to walking attractors is arguably one of the most widely applied environmental quality assessment methods of walkability. www.walkscore.com (Walk Score, 2023) provides a walk score for any given area, which is a value, based on the access of walking attractors or necessities in the vicinity of addresses. Evaluating the attractiveness of opportunities and the effort necessary to access them is a key concept of accessibility (Batty, 2009). The walk score values represent the walkability of the area. This access and walkability is solely based on a generalised proximity by available infrastructure. This means that different groups of people will experience the walkability differently based on their physical capabilities and preferences. There is also no differentiation of needs which means that a great walkability score does not represent everyone. According to Bielik et. al. (2018) multiple studies have shown the relevance of access to walking attractors and its relation to physical activity, walking behaviour and health indicators. The factors affecting the walking experience like for example the aesthetics, pedestrian street network and quality of the infrastructure all affect the walkability of a place (Bielik et al., 2018). So, to improve accessibility, there are two factors necessary. First there must be a reason to walk in the form of a destination, a walking attractor. And second the walk then must be interesting, comfortable and safe to make it a preferable alternative to other modes of transport. Walkability and cyclability both indicate the accessibility of a place on a small scale, the micro scale. They are determined by the qualities and aspects of the place.

2.2.2 Two categories of indicators of accessibility

As just described, there are two different scale levels of assessing accessibility. However there are also two different categories of factors influencing accessibility. Social sustainability as earlier elaborated upon is mainly divided into two categories, hard and soft infrastructure (Shirazi & Keivani, 2018). The aforementioned factors impacting accessibility have mostly been relating to hard infrastructure, the built environment. However just as is the case with social sustainability, factors affecting accessibility can be divided into factors stemming from hard or soft infrastructure. Both of these categories are able to influence the accessibility experience of people and thus influencing their trade-off into deciding to access a place. This research defines these factors affecting accessibility as ‘Physical accessibility’ and ‘Social accessibility’ as seen in the introduction chapter. Physical accessibility is affected by the built environment while social accessibility is defined by the social situation existing within the built environment. Relating back to the triad of social sustainability and research by Shirazi & Keivani (2018), see figure 2. The social situation is shaped and given opportunity by the built environment and the people inhabiting it.

Physical accessibility is experienced through the impact of the built environment on the user. “Physical infrastructure is often conceived in terms of networks of streets and related routes and clusters of land parcels or even buildings” (Batty, 2009 p. 192). The terms noted here are related to the factors earlier mentioned related to the built environment. On the other hand, social accessibility is more complex and challenging to understand because, unlike physical characteristics, the social situation is an intangible subject and revolves around the human factor (Cuthill, 2010). It also has to do with that the physical built environment is designed while the social environment is created by the people that inhabit it which is more difficult to predict than the physical structures.

In literature, social accessibility refers to user groups being able to access public services and amenities (Allard, 2004). This access can be limited by the lack of appropriate infrastructure, high costs of access or more complex like prejudices within society that restrict use. Social access to facilities can also be limited through the aforementioned racial or gender prejudices (Allard, 2004). As can be seen in some American cities where the disparity of social services is closely related to racial and ethnic segregation. In this case 'social' describes the access of a specific group of people and not the accessibility factors related to the social circumstances in an area. Here social accessibility is closely linked to spatial justice which is related to social justice. Social justice is a term used to describe justice within distribution of wealth, opportunities and privileges (Oxford Dictionary, n.d.) Spatial justice as developed by Soja (2010) is the term used when discussing social justice in urban spaces. It is based on the notion that being differently located in space can have negative effects which are rooted in divisions in society based on race, class and gender. Distance and accessibility of services are main concerns in just urban growth where certain groups have less opportunities to reach them (Blend Ed, 2022). The right to the city concept promotes spatial justice and thus advocates for the equal access and distribution of resources in space. Moreover, it also promotes a collective right to participate in the making of the city (Harvey, 2008). Spatial justice and social justice are great terms in describing the spatial equality and inequality of different groups of people. Therefore this research reuses the wording 'social accessibility' to refer to the earlier definition of access influenced by social factors.

Defining social accessibility in such a way is, presumably, not previously done by research. Most indicators affecting accessibility related to social accessibility in this context are classified under accessibility in general. However because this research poses that there is a clear distinction between accessibility factors originating from the built environment which is designed and those from the social situation which exist within them, this definition and distinction is made.

Figure 5, Plaça Reial, a vital urban area with many pedestrian spaces and many walking attractors (Ramblasbacardi, 2015)

Next to a reason to walk and the earlier discussed adequate infrastructure and other physical factors, the human factor is indispensable in determining accessibility. A safe and comfortable feeling falls under social accessibility as it is determined by the social situation of a place. Read: safety from other people, nuisance or even robbery or assault. A desire for safety and comfort comes from the desire for social sustainability and quality of life. There is therefore a desire for urban vitality which is described by Montgomery (1998) as: “the extent to which a place feels alive or lively”. See figure 5 for an example. This phenomenon occurs when there is a diverse mix of functions, reasons to walk, which attracts many socially diverse pedestrians (Maas, 1984). Ye, Li & Liu (2018) therefore argue that a dense urban typology is necessary to supply these prerequisites. This is based on the preliminary notion that a safe and successful city in terms of streetlife needs urban vitality as outlined by Jane Jacobs in 1961. According to Maas (1984) Jacob’s design theory of 1961 also states that urban vitality requires a typology with a high building density. However she adds that the street should be accessible. The accessibility of the street is to be enhanced by the number and variety of amenities to attract socially diverse pedestrians. The presence of people is increased by implementing essential components including a plethora of shops, cafe’s, restaurants and services (Maas, 1984). Mouratidis & Poortinga (2020) found neighbourhood density, land use mix and the neighbourhood proximity to the city center are the main factors defining urban vitality. The higher proximity to the city center, more local amenities to accommodate a high mix of residential and commercial land use, and a higher density all support a higher urban vitality. They also found that green space has a small but not insignificant opposite effect. In that it reduces urban vitality. It might be that the lack of vitality and social interactions in green space gives it its calming and relaxing qualities (Hartig et al. 2014). Mouratidis & Poortinga (2020) note that the proximity to city centres has such a big influence on vitality because the city center has great influence on neighbourhood density and local amenities. They also mention that this is especially relevant for monocentric cities but might just as well be the case for polycentric cities. However, Mouratidis & Poortinga (2020) also find that closer proximity to the city center, higher density and mixed use land use, might reduce social cohesion which “refers to the extent of connectedness and solidarity among groups in society” (Manca, 2014 p. 6026). Wood et. al. (2010) suggests that the formation of local social connections needed for social cohesion might be inhibited by the amount of external visitors attracted to the area. It is possible that vibrant neighbourhoods may foster overall social interaction but are therefore less socially cohesive at the neighbourhood level. Mouratidis & Poortinga (2020) do however find another positive influence of public transport on social cohesion which they argue comes from the increased walking activity to access the transport stops. From this it can be concluded that pedestrian activity in a neighbourhood by the residents can improve social cohesion.

It is necessary for this research that the indicators of accessibility in general are clear so they can form the basis of the empirical research, see table 2. It has to be noted that some of these indicators share aspects or even overlap with indicators of social sustainability. This is because social sustainability benefits from accessibility as elaborated upon in chapter 2.1. Although it makes an effort to be exhaustive, the list of accessibility-related factors is not expected to be complete. This is in line with the hypothesis of this research that not all factors impacting accessibility are known. Which is why this empirical research has been conducted.

Table 2 Indicators of physical and accessibility

Social accessibility Indicator	**Influence on accessibility**
Feeling of safety and comfort	A space must be comfortable and safe to walk for a reason to walk and not take other transport or not visit the place(Bielik et al., 2018)
Social cohesion	Social cohesion creates a more comfortable environment to walk and thus enhances accessibility (Mouratidis & Poortinga, 2020)
Urban vitality	Urban vitality provides safety and comfort in a space and thus benefits accessibility (Montgomery, 1998)
Litter	Litter and filth on the streets has a negative impact on accessibility (Tight, Kelly & Hodgson, 2004)
Traffic safety and crossings	Traffic generated by other users and their behaviour can create dangerous situations and thus limit accessibility (Singh, 2016)
Neglect	Neglect in regards to maintenance of the built environment is experienced negatively (Tight, Kelly & Hodgson, 2004)
Illegal traffic	Cyclists on pathways make walking on those pathways less accessible (Tight, Kelly & Hodgson, 2004)
Air and noise pollution	Air and noise pollution reduce the quality of a space as it can be considered hindering which in turn reduces the accessibility of a space (Tight, Kelly & Hodgson, 2004)
Physical accessibility indicator	**Influence on accessibility**
Walking attractors	Mixed land use allows for diverse and many walking attractors which increases the reason to walk (Bielik et al., 2018)
Pedestrian space	Side walks should be wide enough and be protected from motorised traffic to improve accessibility (Mitropoulos et al., 2023) this is also the case with bicycle paths
Network connectivity	A continuous street network improves accessibility because boundaries and interruptions reduce it (Bielik et al., 2018)
Enclosure	Spaces where the building height is proportionally to the space between them is considered comfortable. (Singh, 2016)
Open facades	Open facades are part of eyes on the street by Jacobs (1961) which enhance safety and thus accessibility
Complexity	Complexity refers to the visual richness of a place in terms of architectural diversity, ornamentation, landscape elements and human activity (Singh, 2016)

Human scale	A human scale in terms of physical elements which match human sizes and human speeds increases comfort Singh (2016)
Imageability	Imageability is a quality of a place that makes it distinct which happens through recognizable and memorable features through for example the aesthetics or ornaments. (Singh, 2016)
Street furniture and decoration	Street furniture and decoration makes accessing a place interesting and comfortable (Singh, 2016)
Greenery	Greenery provides calming and relaxing qualities and thus accessibility (Hartig et al. 2014), it also counters grey and ugly street environment which is a hinderance (Tight, Kelly & Hodgson, 2004)
Public transport availability	Availability to public transport stops enhances accessibility by foot and thus improves walkability (Mitropoulos et al., 2023)

2.3 The 15-minute city concept

The 15-minute city concept is a concept which aims to improve accessibility and by that, social sustainability. The 15-minute city concept that is explored further in this research is the one based on the Parisian concept which is described as a ‘city of proximities’ (Yeung, 2021). There are however a lot of other x-minute city concepts. As Logan et. al. (2022) show, cities all around the world are adopting x-minute city concepts, with for example: Copenhagen setting the target at a 5-minute walk to all amenities and public transport, Melbourne 10 minutes arguing for a 20-minute return trip to all amenities and Paris, Milan and Madrid all advocating for a 15-minute walk or bike ride to all amenities. These x-minute cities are all aimed at reducing emissions and promoting walking and cycling with the goal of achieving environmental and social sustainability (Logan et. al., 2022). They aim to improve accessibility mainly through increasing proximity to the necessities of the city. The reason this research chooses to take the parisian 15-minute city model as the x-minute city definition is because the parisian model is the most elaborated. It aims to enhance social sustainability through enhanced accessibility by more than just increased proximity. It bundles a lot of ideas like: implementing pedestrian-friendly neighbourhoods and making the neighbourhood greener, which aid in achieving a 15-minute city but also improve quality of life on their own. Pedestrian oriented neighbourhoods for example are able to increase social capital as it leads to greater trust in neighbourhoods, which improves quality of life (Leyden, 2003). So the Parisian 15-minute city is more than an x-minute city solely focussed on proximity and takes more factors affecting accessibility and social sustainability into account.

2.3.1 Non 15-minute cities

Figure 6, illustration of a non-15-minute city, (TED, 2021)

To explore what makes a 15-minute 'Parisian' city, it is important to explore what a 15-minute city is not. Figure 6 above illustrates a non-15-minute city. According to Carlos Monero (2016), the growth of non-15-minute cities is faltering because it is still driven by the paradigm of the oil era which imposes a lifestyle based on vehicle ownership and the car being omnipresent in our daily lives. Gössling (2020) argues that cities need to take road space from cars because the paradigm of the oil era still plagues the growth of many cities. Cities, in spite of the growing pressure on urban space, still continue to increase the car capacity of their cities by providing more parking space and additional roads (Hutton, 2013). For this reason, a lot of cities are dealing with problems of road space distribution (Nello-Deakin, 2019). Gössling (2020) adds that individual car ownership and transport makes our cities less liveable through traffic related problems like the congestion, accidents, pollution and the urban heat island effect. These issues make the car in cities a problem for environmental sustainability as social sustainability. The car being so prominent in cities is a challenge for urban growth because the history of car-dependent planning in our cities outlines deep-rooted inequalities in social and economic spheres especially (Newman, Beatley & Boyer, 2017). However some major cities are putting in effort to upgrade their public transport quantity and quality which should bridge those inequalities while reducing private car ownership and emissions (Newman & Kenworthy, 2015).

Driven by car dependency, monocentricity and mono functionality are other problems related to non-15-minute cities. The two ways of building neighbourhoods in history have been compact, diverse ones and ones associated with euclidean zoning (Speck 2017). The massive adoption of the car has made euclidean zoning and urban sprawl possible. The car has become a necessity because of that which makes alternatives like walking, cycling and public transport difficult. The image below, figure 7 illustrates the difference between the euclidean zoning and multifunctional zoning which is closely linked to the 15-minute city concept. Euclidean zoning takes up more space and is car dependent and takes up even more space because of that, while the multifunctional space is not.

Figure 7, Euclidean zoning left versus multifunctional 15-minute city zoning right (Speck 2017)

2.3.2 Decentralisation

Figure 8, illustration of decentralisation towards a 15-minute city (TED, 2021)

Monero (2021) sets decentralisation as the first step in transforming a city into a 15-minute city. This is achieved by developing new services for each of the districts as seen in figure 8. Which includes new economic models to encourage local shops and the diversification of areas make the transformation to a polycentric city possible. This increases proximity to amenities for residents. Proximity in the 15-minute city relates to access to all basic services as provided by the city on foot or bicycle (Monero et. al., 2021). The dimension of proximity is one of the key drivers for reducing necessary commuting time, increasing quality of life, and reducing the economic and environmental impact of commuting (Marquet & Miralles-Guasch, 2015). An optimal density is necessary to make increased proximity possible. Density in the 15-minute city is about the number of people per square kilometre that can be comfortably sustained by the city in terms of demand for resources and urban services (Monero et. al. 2016). Monero et. al (2021) mentions that earlier planning models

viewed the optimal density as the highest density. It is argued that this planning resulted in overconsumption of resources and an over-reliance on fossil fuel. Density is a key component to achieve social sustainability in cities as the optimal density should result in the equitable distribution of resources within the city according to Dempsey, Brown, Bramley, (2012). The key to achieving the optimal density and proximity of essential amenities is mixed use neighbourhoods (Brookfield, 2017). Mixed use neighbourhoods provide governments the opportunity to improve the liveability of neighbourhoods by improving their service delivery. This way, the necessities of different neighbourhoods can be catered to individually which should result in more efficient resource allocation. Nabil & Eldayem (2015) add that the improvement of liveability is important in promoting an open city environment in which different cultures and people can settle. Diversity in the 15-minute city has two components, the diversity in culture and people and diversity in the sense of mixed use neighbourhoods (Monero et. al., 2021). Rodríguez-Pose & von Berlepsch (2019) argue that diversity in culture has a positive impact on the local economy as locals are able to enjoy more cultural products and cultural heritage. Which is important for social cohesion and thus social sustainability. Monero et. al. (2021) express that the benefits of diversity should be applied at multiple scale levels, not only on the urban fabric scale of the 15-minute city itself but also on the scale of buildings themselves.

2.3.3 Traffic replacement

Figure 9, Illustration of a reduction of car traffic in the 15-minute city (TED, 2021)

Decentralisation through increased proximity, optimal density and diversity makes a reduction in traffic possible. Monero (2016) argues for a replacement of car oriented infrastructure by more human forms of transport like walking, cycling and public transport as illustrated in figure 9. Reducing the need and desire for car transportation and replacing it with a demand for other forms of transport has to do with induced traffic demand. Induced demand occurs when one condition is indirectly caused by another condition (Lee, 2022). For example, an increase in highway capacity by adding a lane to reduce congestion will in the long run not work as the increased capacity causes more people to choose that highway which brings back the initial congestion. Travel demand is elastic. Without going into great

detail, it implies that it also works the other way around. Increasing capacity of walking, cycling and public transport infrastructure creates more demand for that infrastructure. The car-oriented infrastructure can be replaced as the main mode of transportation in cities by increasing space for other modes of transportation and reducing it for cars. It must be noted that it is very challenging to completely phase out car-oriented infrastructure in cities because of freight transportation, specific cases and the comfort the car provides. But by increasing the convenience of other modes of transportation the car can become tool for specific use instead of a necessity for all uses.

2.3.4 Ecology enhancement

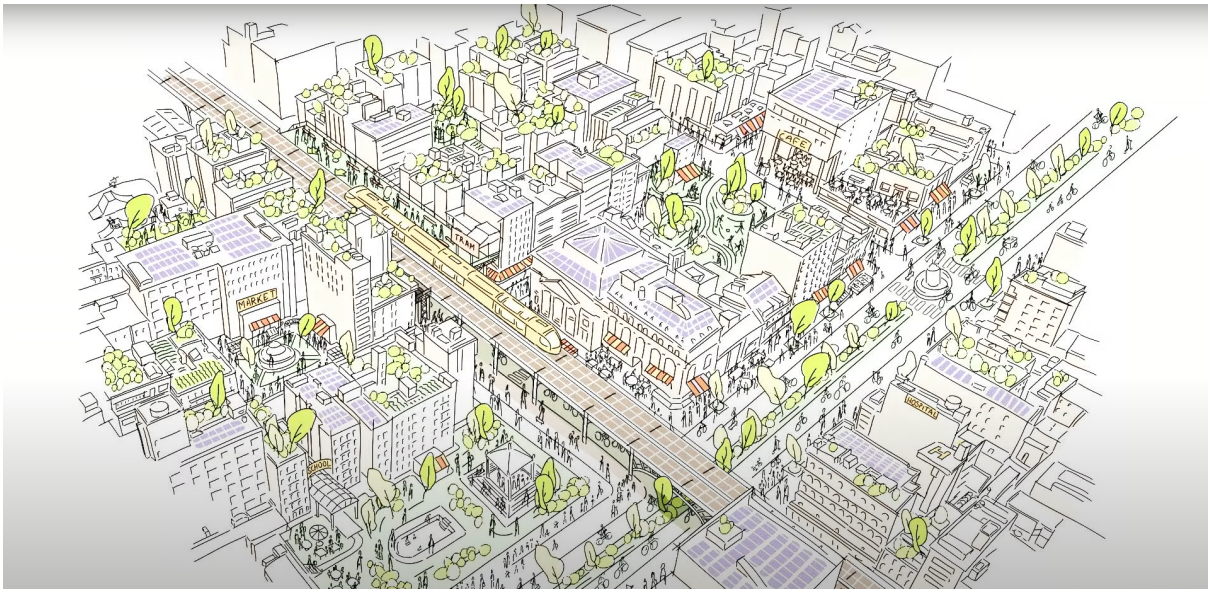


Figure 10, Illustration of increased ecology in the 15-minute city (TED, 2021)

Monero (2021) argues that ecology needs to be enhanced in the 15-minute city. Cities should include more greenery to make healthier cities as seen in figure 10. To give people access to nature in a 15-minute city, nature needs to be accessible within those 15-minutes. However, nature needs to be accessible on even smaller scales as well. Konijnendijk (2019) argues for a few golden rules regarding urban greenery which should improve health and sustainability in cities. The first is that every resident should be able to see three trees from their window. Second, areas should have 30% crown cover, which means that from a satellite image, cities are at least 30% green. And third, he notes that all residents should be within 300 metres of a green zone like a park or a field. Implementing this in cities means cities have to take up space from cars while bicycle and pedestrian use can be combined with it. In the end, intensifying greenery in cities should make the residents more healthy, happy and the city more environmentally friendly which improves social sustainability.

2.3.5 Multipurpose usage

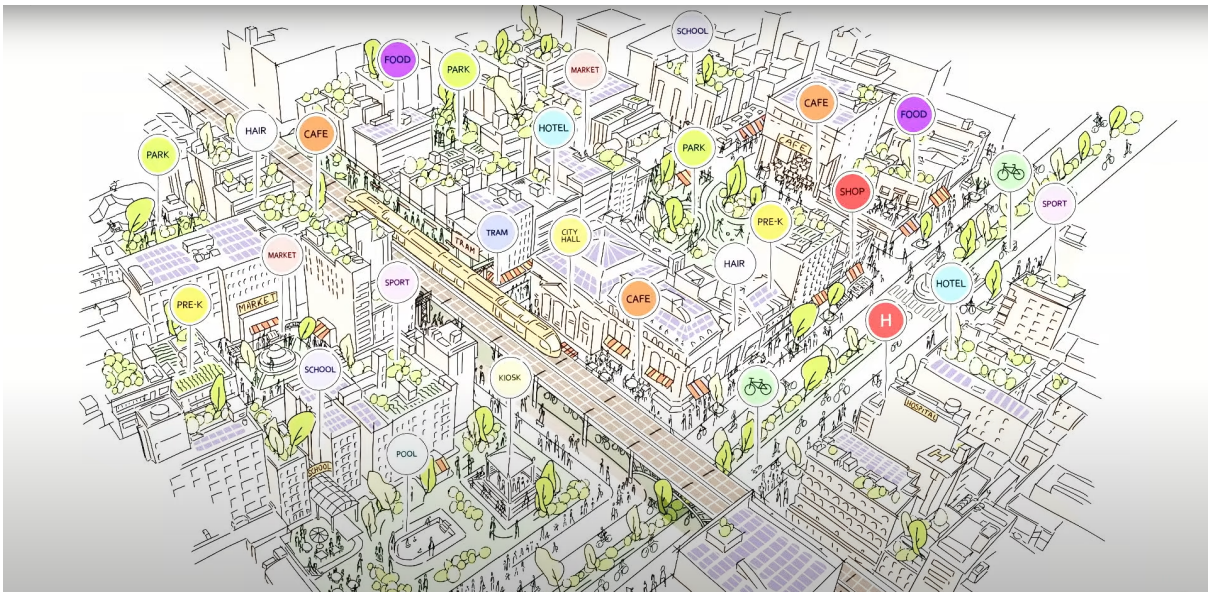


Figure 11, Illustration of multipurpose usage in the 15-minute city (TED, 2021)

In his vision, Monero (2021) advocates for an efficient use of every built square metre in the city as seen in figure 11. This means first and foremost to use every space available efficiently like using free space on roofs for solar panels or greenery. But using space efficiently is more than using all available space for singular purposes. Monero (2016) notes that the rhythm of the city has changed because of new technologies. This so-called ‘neo chrono-urbanism’ of the 21st century city, the ‘Continuous time’ city, means that activities are no longer sequential and bound by time of day. Goods can be ordered any time of day, people partake in leisure activities 24/7 and many jobs are becoming more and more flexible in terms of where and when people want to work. This new rhythm of the city in benefits from a transformation of monofunctional urban space into a multifunctional one. Gwiazdzinski (2014, p.55) built on the concept of chrono-urbanism as he notes that “the borders between the times and places of work and of pleasure are dissolving”. Monero (2021) in response proposes an adaptable city which would make use of the “key of time” to approach the post-carbon city. This proposed chronological approach implies flexible and adaptable urban design. Gwiazdzinski (2014) mentions third level spaces which are a key concept of adaptable cities. Third level spaces are spaces in which a mix of different activities can take place. Think of café-libraries where people come to read, meet, work or get something to eat or drink. In addition, spaces could be used more efficiently when applying a neo-chrono-urbanistic method. By utilising spaces differently in relation to the time of day, spaces could see an increase usage which could improve liveability. Examples of this concept can be found in Paris where the current mayor, Hidalgo, plans to implement children's streets next to school which close for car traffic during the opening and closing hours of the school to improve safety (Reid, 2020)(Clement, 2018). Additionally, she plans to open up the school playgrounds for the public after school hours because it makes more places accessible and interesting for more people. This method of adjusting space utilisation during the day minimises the amount of space required in a city.

2.3.6 Challenges of the 15-minute city

This research aims to answer to what extent the 15-minute city is able to enhance social sustainability. The 15-minute city concept has some challenges on its own which are not related to accessibility indicators. They are discussed here.

The first implementation challenge is existing euclidean zoning. Extreme examples are suburban areas in America. Suburban areas are designed in such a way that they do not allow for the necessary density for the 15-minute city. Suburban areas as seen in figure 12, would need to be completely replaced with a 15-minute city for it to be implemented. The 15-minute city is thus a concept which is only attainable in urban areas and not in suburban areas.

Figure 12, an suburban housing area (Jensen, 2005)

A second more complex challenge for the implementation of the 15-minute city is a general misunderstanding of it. Monero has been surprised by how wrong people got his 15-minute city concept (Hill, 2023). Opposition has interpreted the 15-minute city idea as tool for cities to devolve back into mediaeval hamlets and villages. People a scared that the concept is out to take away their car while the idea of the 15-minute city concept is to take away the need for one. Conspiracy theorist have also gained ground in the debate as Monero has received death threats in response to his ideas (Hill, 2023). People interpreted the 15-minute city as a bubble with the goal to prison people in their own 15-minute cities linking the idea to Covid-19 and 5G conspiracies. These examples are extreme but do show that the social discourse regarding 15-minute cities is crucial to take into account when implementing it.

2.3.7 Indicators of the 15-minute city

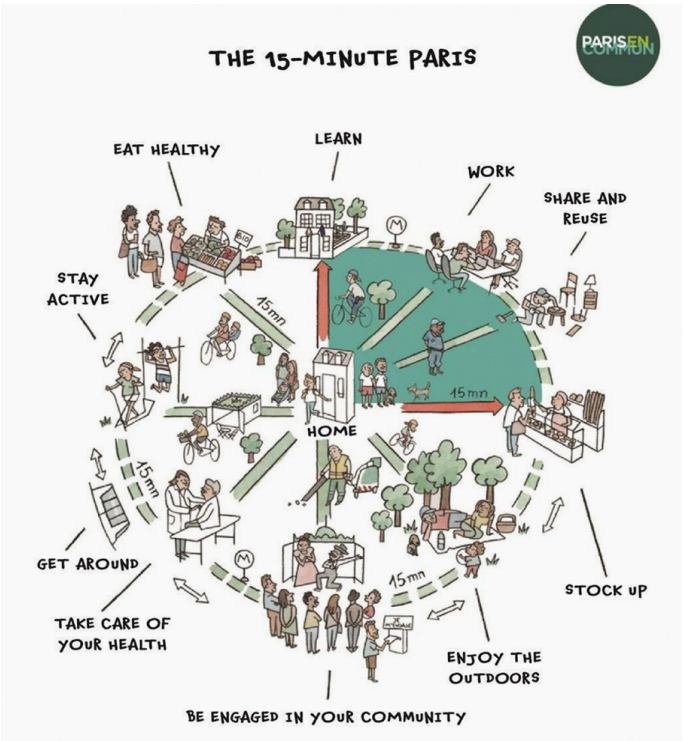


Figure 13, illustration of the 15-minute city as envisioned in Paris (Micaël, n.d.)

The overarching indicator of the 15-minute city is that it very accessible. This is achieved on both scales of accessibility the macro and macro scales while influencing social and physical accessibility indicators. The main indicators which add to the accessibility of the 15-minute city are as follows:

The 3 indicators of the 15-minute city according to Monero (2021) are:

1. The rhythm of the city should follow humans, not cars. *Human rhythm*
2. Each square meter should serve many different purposes *Density*
3. Neighbourhoods should be designed so that people can live work and thrive in them without having to constantly commute elsewhere *Proximity Diversity*

A summative illustration of the Parisian approach is shown in figure 13. The 15-minute city is a city in which the urban dwellers can access all the essential needs of life within 15 minutes of walking or cycling because of increased proximity (Monero, 2016). This hyper proximity as he calls it provides accessibility at all times and through its human approach prioritises people's time, energy and physio-psychological health by relieving their daily commutes (Abdelfattah et al., 2022). Monero (2016) argues that the current 15-minute city concept should provide a higher quality of life because of this. The proximity based planning of the 15-minute city could relieve citizens of their car dependency and give way to the new rhythm of the city (Allam et. al., 2022) . Cities will become more healthy for its citizens as well by reducing car dependency because 78% of emissions in urban areas are caused by motorised transportation (Wiggins, 2021). Although it is unlikely that the demand for transport by car can be removed entirely, it can be reduced through urban restructuring towards the 15-minute city in the dimension of proximity via local consumption and production (Allam et. al., 2022).

2.4 Conceptual model

The literature review conducted for this research has provided the following main concepts as can be seen in figure 14: the 15-minute city, physical and social accessibility and social sustainability.

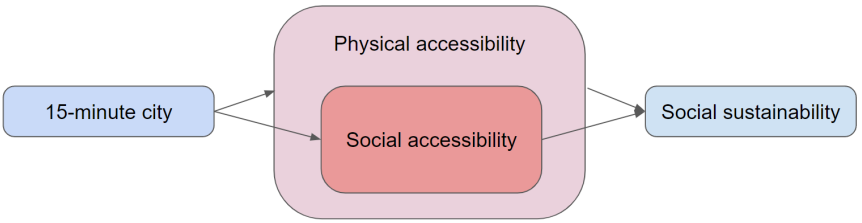


Figure 14, conceptual model of the conducted research (Own work, 2023)

The 15-minute city concept aims to enhance social sustainability through the improvement of accessibility. The 15-minute city concept is related to urban design and planning. However, literature has shown that accessibility is composed of so called physical accessibility and social accessibility with physical accessibility relating to the accessibility impact by the built environment and social accessibility by the people inhabiting it. The research has studied those concepts further to understand what impact the 15-minute city concept has on them. What is not shown in the conceptual model are the 2 levels on which physical and social accessibility are studied, which are the macro and micro level as found in the literature.

Chapter 3: Research method

The concepts of social sustainability, accessibility, and the 15-minute city were developed in chapter 2's literature background. The literature suggests that there is a significant positive link between the enhancement of accessibility by the 15-minute city and social sustainability. This study aims to support that notion but also determine to what extent the 15-minute city influences accessibility in general. This study therefore gathered empirical data which aided in the understanding of how users of the city experience accessibility indicators. Blaikie and Priest (2019), alongside with Graham Gibbs (2013a) (2013b), have provided the necessary fundamental ideas for this.

3.1 Research purpose

Blaikie and Priest (2019) note the importance of realising what kind of answer is sought by the research to understand its purpose. The three available purposes for research are: a description, an explanation/understanding or a proposition for change (Blaikie and Priest, 2019). The research questions used in this research are shown below to find their purpose.

- *MRQ: To what extent is the 15-minute city able to enhance social sustainability? (by enhancing accessibility)*

- *SQ1: What is social sustainability in an urban context?*
- *SQ2: What are the indicators of a 15-minute city and accessibility?*
- *SQ3: To what extent is the municipality of Amsterdam enhancing accessibility in Nieuw-West?*
- *SQ4: To what extent is accessibility experienced by the residents of Amsterdam Nieuw-West?*

There are multiple sorts of (sub)research questions. Blaikie and Priest (2019) state that the purpose of a ‘what’ question is to get a descriptive answer, ‘why’ questions are used to seek an explanation or understanding and ‘how’ questions aim for an answer which brings forth change. All sub research questions are what questions and thus seek a descriptive answer. Together, their answers provide the necessary information to answer the main research question which is a ‘how’ question wich according to Blaikie and Priest (2019) seeks to bring forth change. The change at hand is the change from a urban area without the indicators of a 15-minute city towards one where these indicators are able to enhance social sustainability. To what extent this is possible is the main research question. This correlates well with the notion of Blaikie and Priest (2019) that the change in empirical research is often aimed at an intervention in a social situation, preferably on the basis of an established understanding or explanation.

3.2 Type of study

With the purpose of the research and its questions understood, the type of research can be defined. The types of research as presented by Koolwijk (2022) are: explanatory research, descriptive research, exploratory research and evaluation research. Exploratory research is is suited for exploring a phenomenon which is not extensively studied before. Its purpose is

to better define the problem to gain additional insight. Descriptive research is aimed at describing the characteristics of a problem and focuses on the “what” rather than the “why” or “how”. Explanatory research seeks explanations of observed phenomena or relation by answering “why and how” types of questions. Evaluation research is the systematic assessment of the worth of the resources spent in order to achieve a goal, most often to provide insight for evaluators such as sponsors.

The research in this thesis looks into a phenomenon which has not been researched extensively. The link between the enhancement of accessibility by the 15-minute city and its effects on social sustainability. Previous research has not yet sufficiently explored the entirety of urban accessibility and its relation to the 15-minute city. This research aims to better define the problem of accessibility in a 15-minute city. To achieve this, the study looks for qualitative data instead of quantitative data, relating to data in words versus data in numbers (Blaikie and Priest, 2019). Qualitative data can be used for description and particularity theory crafting. Methods used for this data generally include coding and categorising as it enables the research to gain in-depth knowledge on the not well understood topic, specifically the full impact of the 15-minute city on social sustainability. By categorising the gathered answers of the interviews with residents and passers-by, it could be understood what accessibility indicators are experienced by people and thus in what way the 15-minute city implementation would impact social sustainability as it affected accessibility.

3.3 Research strategy

The strategy used for this research is to use mixed methods for triangulation with the empirical data gathered from a case study. Case studies are one of the three main research strategies along with surveys and experiments (Gibbs, 2013a). It is a method for selecting the source of data and a type of research design (Blaikie & Priest, 2019) It “involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence” (Robson & McCartan, 2016, p. 150). The literature has pointed out two scales on which accessibility can be assessed, the macro and micro scale. So a case study was necessary on each scale. For the macro scale, Amsterdam Nieuw-West was chosen. For this research a case with a link to the 15-minute city concept was necessary. Amsterdam Nieuw-West has originally been designed with accessibility in mind. Also, the municipality is actively trying to improve accessibility in Nieuw-West which made the comparison between accessibility design and experience interesting. Accessibility on the micro scale was studied in Osdorpplein. A plaza in Amsterdam Nieuw-West which was chosen because of its supposed urban vitality. Urban vitality is a sign that a place is accessible which proves that there are at least positive accessibility indicators influencing the access of Osdorpplein. It also provided a link to the 15-minute city as surface level analysis showed that there are a lot of facilities and amenities present at Osdorpplein which improve accessibility on the macro scale.

The empirical research in this case study is conduced to answer sub research question 3 and 4 as literature research was able to answer the first 2. Sub research question 3, which focussed on the extent to which the municipality of Amsterdam is enhancing accessibility, is answered using two research methods: the analysis of case study documents and the interviews with project mangers. Sub research question 4, focussed on the accessibility

experience of inhabitants, is answered using 3 research methods. First the results from sub research question 3, which provided initial insight in what the municipality believes to be the accessibility experience, then the results from in depth interviews on the macro scale and the street interviews focussed on the micro scale. To answer the main research question, the indicators of accessibility found in the literature were triangulated by both the municipality and the end users to confirm their existence and relevance. By using multiple sources of data the validity and credibility of this research is enhanced as it mitigates the presence of research biases in the results of the study (Bhandari, 2023).

3.4 Data collection method

Martin (2013) provides four qualitative research methods which aid in answering a research question: observation, interview, focus groups and surveys. The main goal of this research has been to acquire a deep understanding of indicators affecting peoples accessibility experience and link that to the indicators of the 15-minute city concept. The first data collection consisted of interviews with project mangers and analysis of case study documents to understand the accessibility in design of Nieuw-West and what the municipality believes is affecting the accessibility experience in Nieuw-West. The second data collection consisted of a small survey and a in-depth interview with residents in Nieuw-West to uncover the experienced accessibility indicators on the macro scale. The third and last data collection consisted of short street interviews with visitors of Osdorpplein to study the accessibility indicators affecting the micro scale of accessibility.

3.4.1 Interviews with project managers

The first interviews conducted were the ones with people who have worked for or are working for the municipality of Amsterdam in relation to spatial planning. Which sought to answer *SQ3: To what extent is the municipality of Amsterdam enhancing accessibility in Nieuw-West?* The municipality is responsible for the spatial design of the city and thus partly for its accessibility design. The history of the spatial planning in Nieuw-West as well as the future plans were analysed in case study documents to gain understanding of the implementation of accessibility indicators as found in literature in Nieuw-West. However, to gain a more in depth understanding of how physical as well as social accessibility is planned and designed in Amsterdam Nieuw-West two project managers were interviewed. This aided in understanding what the limits and possibilities are regarding accessibility improvements in Nieuw-West as it tells what has already been done and what has not for which reason. They were able to give a more practical insight in the interventions the municipality is conducting to improve accessibility in Amsterdam Nieuw-West. They also provided a better understanding on the philosophy behind the spatial planning of Nieuw-West and the known challenges. They were also able to add to the researchers personal understanding of social sustainability in urban planning in general. The interviews with project managers were exhaustive as they confirmed each other and those results were in line with the analysed case study documents.

3.4.2 Interviews with residents using mental maps

The second set of interviews were conducted with residents of Amsterdam Nieuw-West to first answer *SQ4: To what extent is accessibility experienced by the residents of Amsterdam*

Nieuw-West? on the macro scale. The residents were primarily approached through the 'van Eesterenmuseum' which is an organisation in Nieuw-West which attracts people interested in the spatial planning history of Nieuw-West and hosts exhibitions. The residents were interviewed directly to gather the most honest and complete responses. First a short survey was conducted to aid in the interview which set the boundaries of possibilities in terms of available transport and other contextual elements. In the interview, residents were asked to draw a mental map which is a representation of a person's perception of their surroundings (Rosenberg, 2019). It is described as a useful technique to help people visualise their decision making process and communicate them to others. Pocock (1972) describes how the environment undergoes filtering and coding of sensory data by the individual and is thus a subjective, private and unique image. Within the environment, it provides the individual confort, orientation and movement. The physical drawing of the mental map is used to uncover the mental map people have of their environment (Graham, 1976). An example of a mental map is shown in figure 15. The method of mental mapping is quite old but proved useful in this research as respondents drew what they deemed important which aided them in deciphering their own decision making process. It is debatable whether the entirety of accessibility indicators affecting accessibility for the residents interviewed on the macro scale had been found would this set-up including a survey, mental map and interview not been used because residents noted during the interviews that they were able to articulate their thoughts directly because of them drawing the mental map.

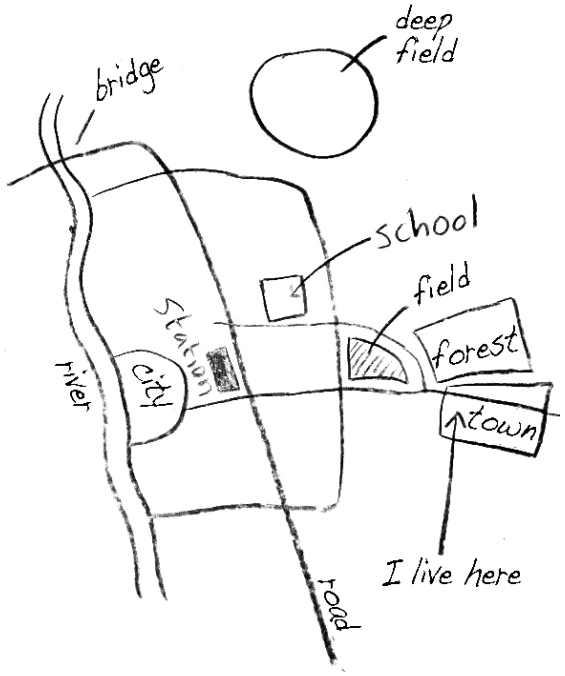


Figure 15, an example of a mental map (Nijeholt, n.d.)

3.4.3 Interviews with passers-by in Osdorpplein

The last set of interviews took place in Osdorpplein to further answer *SQ4: To what extent is accessibility experienced by the residents of Amsterdam Nieuw-West?* on the micro scale. While the accessibility of places in terms of routing, destinations and transportation was examined during the in depth interviews with residents. It lacked the accessibility indicators influencing people into accessing a place on the micro scale. As is further elaborated upon in

chapter 4, Osdorpplein is a recently re-developed area in a post-war city expansion with the goal of becoming a city centre on its own according to the municipality. For this reason the municipality is attempting to improve accessibility and increase its urban vitality. Because urban vitality requires accessibility, the researcher concluded that there must be accessibility indicators present to attract people. The researcher conducted 5 minute interviews with passers-by at Osdorpplein to ask them about the factors they take into consideration when accessing this place. The researcher would also ask for opinions on accessibility indicators from literature as the users experienced them in Osdorpplein like: the transportation, the built environment, social cohesion, safety, greenery and others. This provided a clear view on which accessibility indicators of a place are noticed by its users and which are not. It also uncovered which indicators are taken into account when visiting an area and which are not. The interviews were conducted on 5 separate occasions on different days during the week from which 2 were in the morning and 3 were in the afternoon or late afternoon. This research method of conducting street interviews is promoted by urban sociologist like Zuijderwijk (2023) to gather information regarding social sustainability and accessibility and experiences thereof.

3.5 Data plan

As part of the process, the completed data management plan is submitted through DMPonline TU Delft and evaluated by the data manager of the faculty of Architecture. It confirmed that the process adhered to the FAIR data principles making it findable, accessible, interoperable and reusable. The feedback provided has been considered and implemented before the research was conducted. DMPonline is a tool provided by TU Delft which aids in writing data management plans. The plan was reviewed by the data steward of the faculty of Architecture TU Delft and was given a pass provided that some points were taken into consideration. The main considerations which were taken into account with the data management of this research are discussed here.

The interviewed project managers received a form of informed consent which was signed both times which states that the interviews would be recorded, transcribed and when accepted, quoted. It also included a general introduction, the goal of the research and the process. The project managers are named project manager number 1 and 2 for the sake of anonymity. However, it is noted in this thesis that they are, or were, affiliated with the municipality of Amsterdam as this was specifically required this research as it delved into the municipal interventions and plans regarding accessibility for Amsterdam Nieuw-West. The interview is recorded on the researchers personal phone and the transcription, which is written in a .doc file, is saved on the researcher's personal computer. The finished transcription was sent to the project managers for approval, and was accepted both times, after which it was utilised for answering the research questions.

The residents interviewed were handed an informed consent form by email and when the meeting took place. They were informed about the goal of the research beforehand to spark interest. This took place in the van Eesterenmuseum in Amsterdam Nieuw-West. The form handled expectations and specific details regarding the use of personal data specifically regarding the use of the mental map. Although the interviewee's name is not recorded, the mental map, which is a visualisation of a personal experience, may allow for the interviewee to be identified. The drawn mental maps were therefore edited by the researcher to make

sure the interviewees are not traceable. This retains the resident's anonymity while still serving illustrative purposes in the the thesis.

The on the street interviews with users in Osdorpplein were conducted with no prior connection to the interviewees and were chosen based on the assumed interviewees willingness to participate by the researcher. The researcher took notes in a physical notebook and the only personal information that was recorded was the assumed gender, estimated age group and location of residents with the options being Amsterdam Nieuw-West, all of Amsterdam or outside of Amsterdam. This led to no traceability which made it ethically safe to process the answers in the thesis of the researcher.

3.6 Data analysis in qualitative research

In his lecture Graham Gibbs (2013b) notes that there are four main quality criteria for data analysis in qualitative research: credibility, transferability, dependability, confirmability. How this study aims to make sure these criteria are met is discussed below. An aspect that must be noted is that to achieve transparency and scientific reproducibility, formal publication of the thesis is necessary (Wilkinson, M., Dumontier, M., Aalbersberg, I. et al., 2016). However, as this is a masters graduation thesis, the thesis will only be officially published on the education repository of the TU Delft. This means it is difficult to adhere to the FAIR guiding principles of Findability, Accessibility, Interoperability, and Reusability.

3.6.1 Credibility

Credibility is by Gibbs (2013b) described as that we as humans can understand that it makes sense. The results are valid because if someone with the same background, experience and qualification would experience the same phenomenon and would conduct the research in the original researcher's place, their experience would be similar. It has to do with the question if the the researcher is measuring something that is really there. This is important because this empirical research focuses on social phenomena, the reality of things is questioned because the social world is an intangible concept that is created by people instead of a given by nature (Gibbs, 2013b). The accessibility experience in Amsterdam Nieuw-West and the impact of the 15-minute city on social sustainability are made up concepts. The literature review confirms that accessibility and social sustainability as a concept exists. This research however also differentiates physical and social accessibility. The indicators within these categories have been observed before so it is assumed that this research is credible.

3.6.2 Transferability

Transferability, also known as applicability or generalizability, relates to the transferability of the results of the study to other cases (Gibbs, 2013). To avoid bias, the researcher has had to aim for representative respondent groups for all research methods. The interviews with project mangers were few but did confirm each other. The views of the project managers were also in line with the information found in the case study documents. The transferability of the results from the few in-depth interviews utilising mental maps with residents is limited as the sample group mostly originates from one source which also resulted in few interviews which was caused by the limits of the researchers capabilities. The transferability of

interviews with passers-by are limited also because of the limits of the researchers capabilities. The researcher was able to interview 50 passers-by which is a small sample size when comparing to the amount of inhabitants of Amsterdam Nieuw-West. The sample size is also limited by the time window in which the street interviews took place as they all took place during the late morning to early evening and not for example during the late evening. The transferability of the results from these interviews is also limited because of the fact that only one case study was conducted on both scale levels of accessibility. There is an inherit bias in only interviewing residents of Nieuw-West and passers-by of Osdorpplein. However, the transferability of the results is improved by the fact that they are mostly confirmed by literature and the case study documents and the results from the interviews with project mangers.

3.6.3 Dependability

Dependability is about the replicability of the research by other researcher. (Gibbs, 2013b) Lab experiments for should provide the same results each time, but case studies do not necessarily because of their ever changing context. The interviews with project mangers are not very dependent on the researcher as the project mangers answered the interview questions from the perspective of their function. All project mangers affiliated with the municipality of Amsterdam should share the same insights, especially when applying the same interview questions. The groups, residents of Nieuw-West and passers-by in Osdorpplein, are dependent on the researcher in terms of selection. Other researchers would be interviewing different people and it would be reasonable to assume that other researchers would gather different data from different people originating from these same groups. The dependability is limited by the set interview questions. Dependability played a big role during the interviews with passers-by in Osdorpplein as the researcher was not able to connect well with all demographics passing by in Osdorpplein which might have manifested in underrepresentation or translation errors creates a bias in the results.

3.6.4 Confirmability

Gibbs (2013b) states that confirmability refers to the attitude of the researcher. Confirmation bias occurs because of the tendency to favour information that confirms or strengthens beliefs or values which translates into being in favour of certain results in research. This is especially difficult to avoid in qualitative research as most often the case is with this research, the people conducting the research have interest in the topic that they are researching and are looking for certain answers. The researcher was affected by this bias as the research was looking to prove the hypothesis that there are unknown factors affecting accessibility which need to be taken into judging to what extent the 15-minute city is able to enhance social sustainability. During the interviews the researcher attempted to avoid this bias by taking responses at face value. Another bias associated with confirmability is the observer-expectancy effect, which occurs when a researcher expects particular results and unintentionally searches more for them. The researcher attempted to avoid this bias by avoiding suggestive questions and instead ask open questions to avoid pushing respondents into certain answers. Zuijderwijk (2023) also notes that respondents might provide desirable answers for various reasons, like for example a desire to be liked. The researcher attempted to avoid this by pressuring the respondents as little as possible.

3.7 Ethical considerations

A few ethical considerations had to be taken into account during this research. Bhandari (2022) notes that ethical considerations work to: protect the rights of research participants, enhance research validity and maintain scientific or academic integrity. The relevant ethical issues for this thesis are first and foremost voluntary participation for all participant groups. The residents and project managers were able to opt out of the study even after signing the informed consent form which made sure that the participant knows what the study is about, the process, the time required and the researchers supervisors contact information. Important to note is that the interview with project managers was record and transcribed. After the transcription was finished, it was sent to the project mangers to provide them with 2 weeks in which they could review and request removal of parts in the transcription from which results will be analysed. Both project managers did not request any changes to the transcription. It was considered that residents or end-users might expect the conducted study to have direct impact on their living environment because they were asked to provide, what could be considered, feedback on it. However, their responses would not directly lead to changes in the built environment or social situation as the researcher is in no position to do so. It was clearly communicated to the passers-by and residents beforehand that their responses where purely gathered for the personal educational progress of the researcher. It was also restated in the informed consent form which all participants of the resident study have signed. During the street interviews, the respondents were immediately informed of the purpose of the research after the initial connection before any interview questions where asked.

3.8 Operationalisation

The general research method for this study is as described before in this chapter. This subchapter describes how this data collection is operationalized. The empirical study is conducted to answer research question 3 and 4 focussed on the user experience from the municipalities perspective and the user perspective themself. A general overview of the operationalisation is provided in Appendix II.

3.8.1 Interviews with project managers

The first set of interviews were conducted with project mangers which was focussed on their accessibility experience from the perspective of a project manger in Amsterdam Nieuw-West. The goal of these interviews was to gain understanding of the municipality's view on accessibility in Nieuw-West. So, case study documents were analysed first after which the project mangers were interviewed about the subjects found and their relation to accessibility. The case documents consisted of news articles, policy documents, development plans and the 'Omgevingsvisie 2050' or spatial vision of the municipality. The interview questions can be found in Appendix III. The literature, as well as the case study documents have pointed out the importance of rethinking car traffic and its relation to densification of the city to improve accessibility. So the project managers were asked about their professional opinion on the effect of car traffic on accessibility in Nieuw-West. They were also aksed to elaborate on the general spatial planning in Nieuw-West and how that affects accessibility. These first questions focussed primarily on physical accessibility so the project mangers were also asked to comment on the social accessibility indicators in

Nieuw-West as found in literature and in the case study documents. These questions focussed on social cohesion and urban vitality. Specifically they were asked to comment and elaborate on information found in the 'Omgevingsvisie 2050' which for example address the need for spaces for different demographics. This way the indicators found in literature could be triangulated with practical insight from the case study documents and views of project managers.

3.8.2 Interviews with residents

Residents of Nieuw-West were interviewed to gather data on the user experience of accessibility on a macro scale in Amsterdam Nieuw-West. Even though these people were gathered from a group of people interested in spatial planning in Nieuw-West. The interviews were aimed at their experience as a user. As mentioned in the data collection method, mental maps were used to aid the verbalisation of the trade-offs based on accessibility as literature has shown that these are a useful tool for this kind of research. Appendix IV shows the interview questions prepared for these interviews. First the framework regarding the destinations of the residents, their available mode of transport and more contextual factors like family composition and the influence of weather on their commute was defined. The interviewees where then asked to draw the mental map which included their destinations and routes which visualised their decision making process. They were also asked about their chosen mode of transport and their reasoning behind that decision. This made it possible to ask for the accessibility indicators as found in literature which affected their decision making process related to their route, destination and mode of chosen mode of transport. This resulted in the residents noting the positive indicators that affect their accessibility experience when choosing their preferred routes, destination and transport. To find the indicators which negatively affect their accessibility experience, they were asked why they did not choose other routes, destinations and modes of transport reasonably available to them. This could then be compared to the indicators as found in literature and the ones that the project mangers from the municipality had noted.

3.8.3 Interviews with passers-by in Osdorpplein

The street-interviews in Osdorpplein were conducted with passers-by to gather end user experiences of accessibility on the micro scale. These experiences were necessary to compare them with the indicators affecting accessibility on the micro scale gathered from literature and mentioned by the project managers. The interviewees were interviewed using simple questions because their experience from the perspective of the end user was required. Because of this perspective, the researcher assumed no prior interest or knowledge regarding spatial planning or indicators of accessibility. The interview questions used at Osdorpplein can be found in appendix IV. The interviewees were asked what they liked and what they disliked about Osdorpplein, what mode of transport they used and what their reason was for visiting. The indicators of accessibility as found in literature were used to aid in the interview questions as it helped interviewees comment on them in what way they were or were not experienced in Osdorpplein. Which made it possible to analyse whether the indicators as presented by literature and the municipality were indeed experienced by users.

Chapter 4: Results

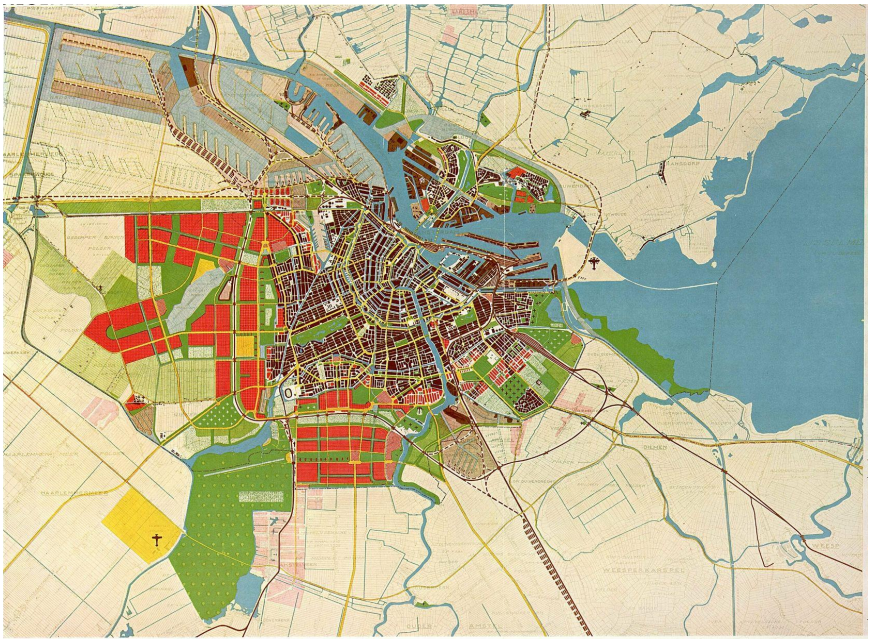
This chapter dives into the results gathered from the collected data to answer both SQ3 and SQ4. *SQ3: To what extent is the municipality of Amsterdam enhancing accessibility in Nieuw-West? SQ4: To what extent is accessibility experienced by the residents of Amsterdam Nieuw-West?* The results are split between the case study of Amsterdam Nieuw-West as a whole and the case study of Osdorpplein. The analysis of accessibility in Nieuw-West is primary focussed on accessibility indicators of the macro scale but also cover indicators of the micro scale. The analysis of accessibility in Osdorpplein focussed on the accessibility indicators of the micro scale but also cover indicators of the macro scale.

4.1 Urban design of Amsterdam Nieuw-West

This part includes the way Amsterdam Nieuw-West is designed especially in relation to accessibility. Which is compared to the current vision on accessibility of the municipality articulated through the 'Omgevingsvisie 2050' and two project managers affiliated with the municipality. This is done to gather practical knowledge on which accessibility indicators are experienced by residents according to the municipality and sets a framework of the accessibility indicators which are already being addressed. The results from the interviews with residents show which accessibility indicators are experienced on the macro scale.

4.1.1 History of spatial planning in Nieuw-West

As mentioned in the introductory part of this research, Nieuw-West was chosen as an case study because of its historical spatial planning focussed on accessibility in combination with its recent development. Amsterdam Nieuw-West also shows a lot of indicators of a 15-minute city while not being designed as such. The spatial planning of Nieuw-West is designed by Cornelis van Eesteren and visualised in the 'Algemeen Uitbreidingsplan' or general expansion plan or AUP for short. See figure 16.



Figuur 16, Illustrative image of the designed General Expansion plan by van Eesteren (van Eesteren, 1935)

Amsterdam Nieuw-West is a city expansion built between 1936 and 1965 (Van Eesteren Museum, 2023a). It was designed as an answer to the crisis plaguing Amsterdam till the end of the 19th century like bad quality housing, bad hygiene in the streets and mass unemployment during winter. In 1901, the ‘woningwet’ was introduced to make it impossible to built low quality housing and promoted the development of high quality housing. During the 1920’s and 1930’s the urbanistic views regarding city planning changed towards the garden city approach where ‘licht, lucht en ruimte’ or loosely translated light which put a focus on space and greenery to enhance social sustainability. The influence originated from the England and the United states where the concept of the garden city originated from. In Nieuw-West it made greenery and water the defining factors of the spatial structure in contrast to the inner city, where the buildings mostly served that function.

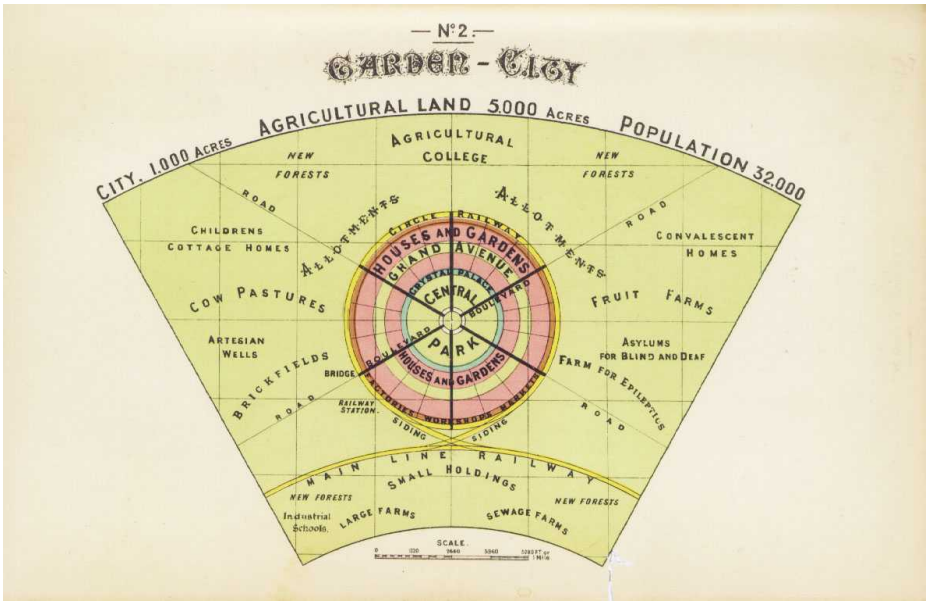


Figure 17, illustration of the Garden City concept (Howard, 1902)

As seen in figure 17, a garden city was designed as a self sustaining city in a rural environment. Howards vision contained a satellite city which separated living and industry while decreasing commuting distance to work, school or groceries (Van Eesteren Museum, 2023b). Which increased accessibility on a macro scale. Another goal of the garden city was to unite the rhythm and peace of the rural communities while enjoying the facilities of the big city which link to the social accessibility features on the micro scale. This vision shows clear overlap with the 15-minute city concept as it aims to reduce commutes by increasing proximity. However, one of the main indicators of the 15-minute city concept is mixed-use spaces and buildings while the garden city, especially as elaborated upon by van Eesteren, used functional principles to order functions like living, work, traffic and recreation. The idea of the garden city is that it is a self sustaining satellite city and thus self-reliant. Van Eesteren took the idea of the garden city and designed Nieuw-West as depicted in the AUP where indeed functions are separated but each neighbourhood did had access to its own stores, schools, churches, greenery and playgrounds. Which in turn did lay the foundation for a Nieuw-West as a district resembling a 15-minute city as it shares the indicator of having most of the basic necessities within 15-minutes of cycling and walking.

Characterizing of the AUP is the ordering which Van Eesteren designed. Accessibility was enhanced by separating passing traffic between areas and destination traffic within neighbourhoods. Stores and businesses were planned next to busy roads so that housing is not. Mid level high rise is alternated by singe family homes, and all are optimally orientated towards the sun (Van Eesteren Museum 2023c). This in addition to the big, open green spaces was the basis of the 'licht lucht en ruimte' approach. Which provided breathing room and ample availability of nature for new residents of Nieuw-West. It seems logical that all these improvements were aimed at increasing the quality of life of residents to enhance social sustainability as a response to the low quality of living in the city from before.

4.1.2 Municipal vision on Nieuw West

The AUP was delivered in 1935 and development really started after the second world war. Nieuw-West was developed between 1936 and 1965 and is now partly being redeveloped (Van Eesteren Museum, 2023c). Part of this redevelopment is linked to concepts also found in the 15-minute city concept like improved proximity, transportation replacement, decentralisation, greenery and accessibility in general. In order to understand what indicators contribute to improving social sustainability of the city in general, the vision, plans, and policies of the municipality regarding accessibility in Nieuw-West as well as their project managers are analysed in this section. This was used as a framework for the analysis and comparison with user responses.

4.1.3 The municipal vision regarding mobility in Nieuw-West

The 'Omgevingsvisie' by the municipality of Amsterdam (2021) is a document describing the long term vision regarding the spatial planning in the city. For this reason it forms the basis for understanding what the municipality describes as challenges and goals in Nieuw-West and how that connects to main components of this research: social sustainability, accessibility and the 15-minute city. This is compared with the insights of two project managers both affiliated with the municipality of Amsterdam. Project manager 1, PM1, is actively employed in the spatial planning department of the municipality. Project manager 2, PM2, is officially retired but has also been employed in the spatial planning department. The main points of the 'Omgevingsvisie' are discussed and commented on by the PM's.

The city of Amsterdam needs to densify as the borders can't be extended much further and the number of people moving into Amsterdam is growing. This means that the infrastructure has to accommodate more people as well. The 'Omgevingsvisie' (2021) specifies that there is no room to accommodate more cars in the city so they envision a mobility transition where the increasing number of travers will increase but the amount of car traffic will not. See figure 18.

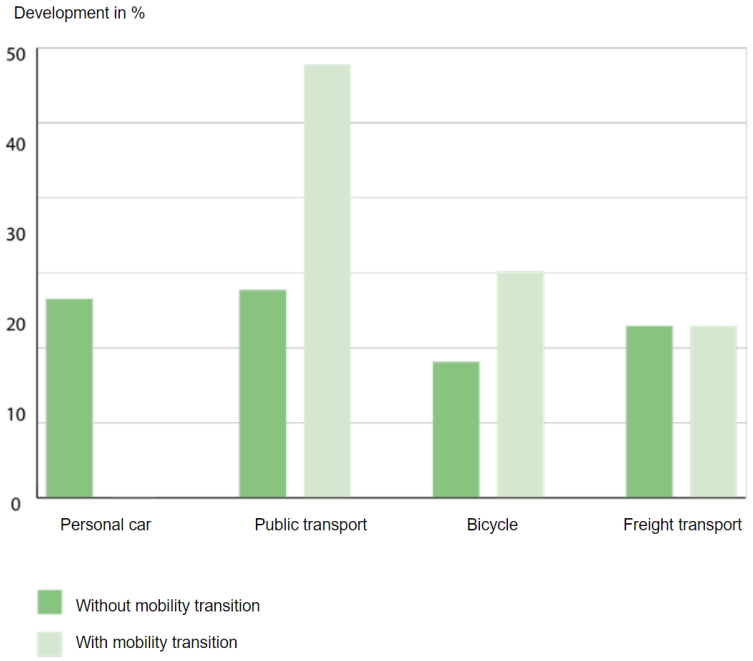


Figure 18, expected traffic growth of usage towards 2050 with and without the mobility transition (Municipality of Amsterdam, 2021)

This means that space used for cars is going to be reduced as cycling and walking get priority. The municipality also understands that there are a few prerequisites for the reduction of cars in the city. To reduce usage of one mode of transport, the other modes will have to be improved upon. So the city is investing in public transport, safe and attractive bicycle and walking infrastructure and well designed transfer hub's.

PM1 agrees that in Amsterdam Nieuw-West there is too much space accommodated for cars. He notes that the car is glorified in Nieuw-west. A lot of communities in Nieuw-West love their cars and because of it, Nieuw-West. This is because at the moment the car has a lot of space with a lot of parking opportunities and wide streets. For this reason PM1 states that it will be difficult to reduce car usage in Nieuw-West as people here, even more than elsewhere are really attached to their car. He states that because of the continuous increase of residents in Nieuw-West, some day the car has to be drastically reduced from the street as there will simply be no more space for it as the city prioritises people, greenery and buildings and thus livability.

"The funny thing is, greenery, walking and cycling can be combined. The car is difficult to combine as bicycle paths and footpaths can exist in a soft environment while cars always need concrete and stones." -PM1

The city has to improve accommodation for cycling and public transport immensely while reducing the space for cars. Reduce the speed of traffic on streets and make them liveable by adding functions which invite walking. Something benefitting bicycle usage in Nieuw-West lies in the originally built housing in Nieuw-West as they were designed with a lot of storage. This is partly the reason that you see so many electric bicycles in Nieuw-West. As people are able to safely store their electric bicycle.

Another mention by PM1 is about the routes for cars. The routes from Nieuw-West towards the city centre are well designed to accommodate fast car traffic, like the S106, or Cornelis Lelylaan as it is better know, see figure 19.

Figure 19, Cornelis Lelylaan (Google, 2022a)

According to PM1, the Lelylaan is a comfortable highway into the city while the same route travelled by bicycle is a disaster in ease of access as you get lost constantly. PM1 notes that if you bring cars into the city, you have to provide parking for them and not spend that space on other functions. The car should become a vehicle to reach out of the city, not inwards.

“Why should you be able to reach everything by car?” -PM1

PM2 relates the current car centric design to the plans of van Eesteren, the AUP. He notes that van Eesteren has planned Nieuw-West to be very spacious by design. There is a lot of room for the car, but also for greenery, for walking and cycling. The downside of this vastness is that you need the car more than in dense areas. According to PM2, In the city centre it is nearly always faster to walk somewhere than to take the car while the open spatial planning of the AUP in Nieuw-West has made the car most efficient mode of transportation. This mindset was used to design the many big alleys for cars to move through the city like the Lelylaan. PM2 is also of the opinion that that way of designing infrastructure for cars has taken up too much space and that ‘inner city highways‘ should be redesigned.

PM2 als mentions the increase of comfort and accessibility accompanying a reduction of cars in Nieuw-West. Just like the literature and the ‘omgevingsvisie’ suggest, a reduction of cars will decrease air and noise pollution in the city. It also makes travelling in the public space as a pedestrian or cyclist more comfortable. Even waiting at a public transport stop becomes more comfortable if there are less cars driving past you like for example at the Burg. Rendorpstraat, see figure 20.

Figure 21, Burg. Rendorpstraat tram and bus stop where cars drive quite closely to the stop (Google, 2022b)

It would also be quite nice if the cars can be removed from the streets within neighbourhoods according to PM2. It would be great if some parking spots could be removed to make a safe space for playing children or an open space to park your bicycle or even just more space for planting trees as it would increase the quality of the neighbourhood and improve accessibility. He does mention the resistance that would create from residents wanting to park their car for example in front of the house to which he responds that those people are falling behind. Reducing car usage in the city would also improve other traffic, not just the space on the infrastructure but also the safety and efficiency with which bicycle, tram, bus and even pedestrian traffic can take place. Movement through the city will feel more accessible as cars are such a hindering factor in that regard.

So the municipal vision regarding cars is clear. Amsterdam and especially Nieuw-West has to reduce their car usage. This frees up the space needed to accommodate the growing number of inhabitants. This space is needed for more efficient and healthier infrastructure like wider bicycle lanes, efficient public transport and comfortable pathways. The reduction of cars will be met with resistance and it is therefore important to make the alternative modes of transport more desirable than car usage in the city.

“Reducing cars will make the city more accessible because it becomes more pleasant to move around without one” -PM2

4.1.4 Is Amsterdam Nieuw-West a 15-minute city according to the municipality

The municipality states that a densifying city is a healthy city to live as long a the air is clean, safe and invites play and human movement (Omgevingsvisie, 2021). Therefore, there is a need for proximity. The municipality plans to have neighbourhood facilities, shops and entertainment venues within walking and cycling distance. They put a limit of 15-minutes

cycling on reaching big green areas and urban facilities. The municipality does not mention the 15-minute city concept as a total plan but does indeed play into the integral part of a 15-minute travel time by walking or cycling.

PM1 and PM2 agree that Amsterdam Nieuw-West is not a 15-minute city at the moment. However it does come close as PM2 notes that you can reach nearly all facilities within 15-minutes of cycling. 15-minutes of walking would not reach all necessities within Nieuw-West. Especially sport facilities are centred in Ookmeer and thus quite far for a lot of people. It is reasonable to also say that some work will always be outside of the 15-minutes bicycle or walk distance. But it is possible for other facilities to be more close by by mixing functions in the same area so that you can at least travel there without a car. PM2 further mentions that public functions like libraries provide important functions as they are able to mix functions. They provide a place to work, study and often include copy and print machines. This makes the library an office for some and makes that they can work and study closer to home.

“Actually, Nieuw-West is nothing more than a sleep city” -PM1

PM1’s initial response was that Amsterdam Nieuw-West is a sleep city, or satellite town. However when asked he notes just as PM2 that nearly all facilities can be reached within 15 minutes of walking or cycling. Based on his response the assumption is that PM1 is of the opinion that Nieuw-West is a sleep city because of the other accessibility indicators influencing accessibility apart from the proximity and availability of facilities.

4.1.5 The urban fabric and accessibility in Nieuw-West by the municipality

The ‘Omgevingsvisie’ (2021) states that the accessibility of the city heavily relies on the internal connection between neighbourhoods and the networks for walking, cycling and public transport.

PM1 refers to ‘Sportpark Ookmeer’ in his example regarding accessibility in terms of network. He is of the opinion that ‘Sportpark Ookmeer’ is not accessible enough. It is enclosed by water and the main entrance and exit is a busy road, the Troelstralaan cuts right through it. See figure 22 where the Troelstralaan is highlighted as well as the few bridged.

“So we say that that fabric of the park in relation to those neighbourhoods is not right, so you actually need to make maybe 10 entrances so that that little boy who needs to play sports or that girl who needs to go to the gym, that they can get there easily. … If you look at the fabric through the city there are dozens of places where it fails” -PM1

Figure 22, Sportpark Ookmeer with the Troelstralaan and bridges highlighted, (Google, 2023b)

PM2 talks about the network in Nieuw-West that needs to be improved to succeed in achieving a comfortable 15-minute walk to destinations. The Network should comfortable, safe and logical to walk.

“You have to be able to reach your tram station via a logical and comfortable route, then its not a problem to walk 10 min to get there” -PM2

He states that when your routes are predictable, logical and safe, they are easy to travers, it adds to your accessibility experience. PM2 further goes into the quality and overall pleasantness of the routes. Some routes are more fun than others, some walking routes might be the fastest but make you walk next to a busy road. While speed and efficiency is quality on which most routeplanners are based, PM2 talks about how route planners like google maps might want to implement options based on comfort and “fun”. Like this route leads through a park or this one is only straight lines and logical. The implementation of such a software is beyond the scope of this research but a nice thought about what pedestrians would base their routing on.

PM2 laid the foundation of a uniform public space design which would later become the Puccini method. The Puccini method represents well planned public space and a design which is user-friendly, accessible, safe, controllable, sustainable, affordable, connected and beautiful (Municipality of Amsterdam, 2023). It contains two manuals. One related to the hard surfaces, public lighting and street furniture called red while the other called green is related to the correct way of applying greenery in the city. This method is applied to make the public space more accessible among other goals like more sustainable, manageable. This is done by simplifying the design of spaces trough limiting the ‘puzzle pieces’ available for space design. Its core concepts are rooted in its simplicity, its impact on the user and the

its intended use by the user. PM2 describes the Puccini method as a way to bring unity and design into the public space without making it boring. Which is achieved by thinking about what the space is going to be used for and picking the right puzzle pieces accordingly.

Figure 23 shows an example of the Puccini method applied well. The asphalt in the Ferdinand Bolstraat has been replaced with bricks, signifying to its users that the primary user of the street has been changed from fast car traffic to slow moving traffic.

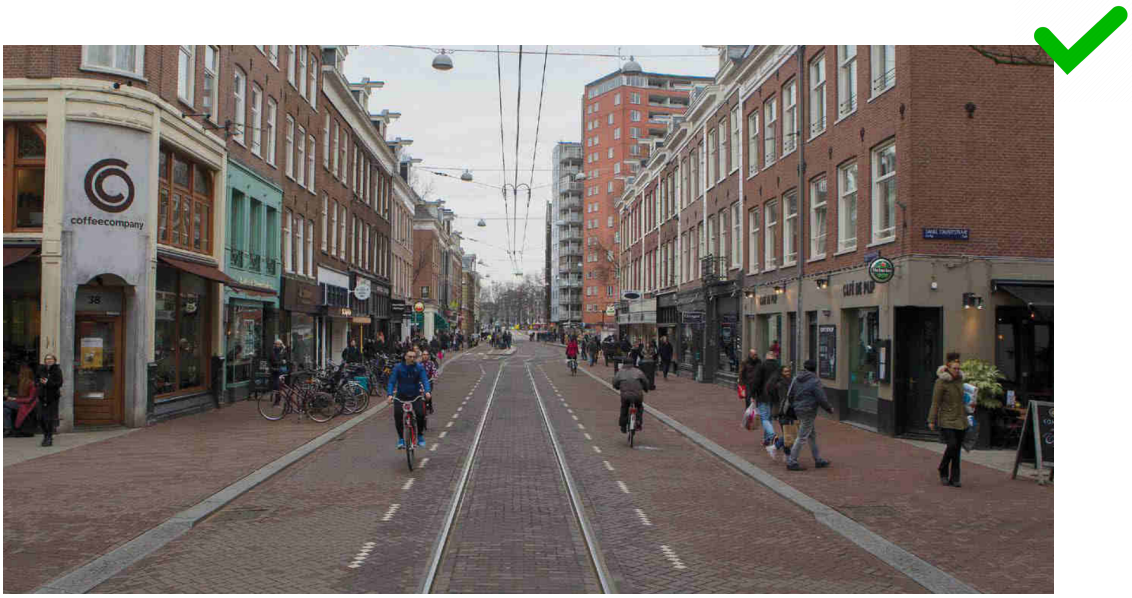


Figure 23, Ferdinand Bolstraat exemplifying the application of the Puccini method (Municipality of Amsterdam, 2018a)

Figure 24 shows an example of the a street where the Puccini method is not applied. This is signified by the usage of more than three main materials which according to the municipality gives of a messy look.

Figure 24, small scale neighbourhood street where te Puccini method is not applied (Municipality of Amsterdam, 2018a)

4.1.6 The impact on social mix by the municipality

According to the ‘Omgevingsvisie’ (2021), the municipality plans to invest in social and physical connections. Connect old and new inhabitants by mixing them through dwellings and facilities. However they are also aware that different demographics have different needs and are attracted to different spaces. So the municipality and both project managers understand the need for people to mix but also recognise the fact that people need their own space and that people wish to make different use of it.

For example, PM2 talks about the fact that people from all over the world have settled in Nieuw-West between all the parks and green spaces. And what the municipality has noticed is that the new Nieuw-Westers from around the mediterranean sea enjoy barbecuing together in the park which leaves scorch marks in the grass. According to the municipality , the Sloterpark was initially not designed for this usage. So the municipality installed specified places with concrete bbq’s which now see regular usage and the parts of the parks which are not designed for it are untouched. This did lead to some opposition from long time residents according to PM2 which he dismisses.

“However, the world does not keep still, no so get along with it.” -PM2

PM1 is also clear about his vision regarding mixing different demographics. The baseline is that the public space should be accessible to everyone, it must be safe and well maintained. However it more than makes sense that places where a lot of people from one culture live together, businesses orientated towards that culture will thrive which attracts more people from that culture and so on. However, those who do feel little connection to the dominant culture feel less at home as a result. PM1 is of the opinion that the character of a neighbourhood should represent the people that inhabit it which provides people their own space.

“Moroccan or Turkish youths are looked down upon at Rembrandtplein but they feel welcome in their own neighbourhood in for example Plein 40-45, and they love it” -PM2

These comments tie in with the concept of spacial justice as PM1 and 2 both advocate for spaces accommodate for every demographic which clearly supports social sustainability.

4.2 Amsterdam Nieuw-West Experienced

Accessibility to facilities and available routes is an integral part of the accessibility experience on the macro scale. Residents of Amsterdam Nieuw-West were interviewed about those subjects alongside the drawing of a mental map which aided their elaboration on their accessibility experience in Nieuw-West. These interviews were in-depth and helped uncover the total trade-off residents of Nieuw-West make when visiting their destinations. Below in figure 25, one of the drawn mental maps is shown. The routes and destinations are drawn as well as other noted spatial elements in Nieuw-West like the Sloterplas and certain roads.

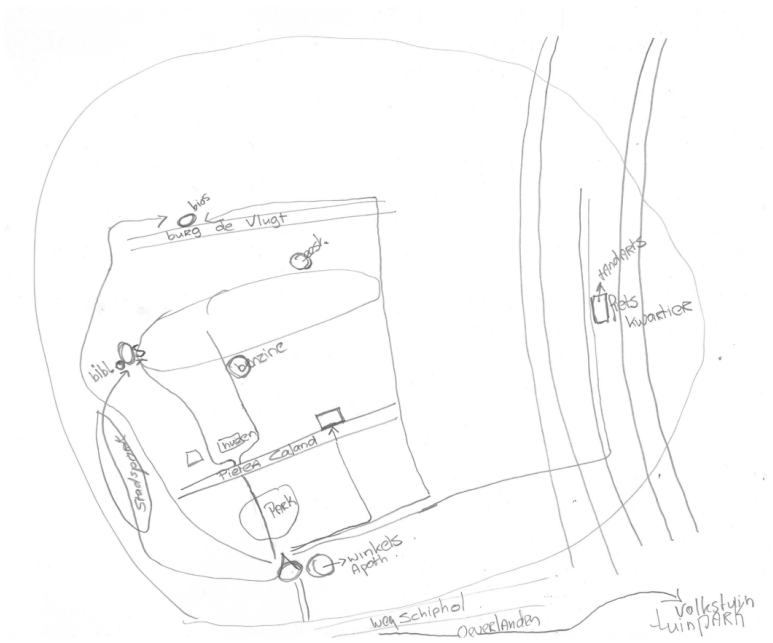


Figure 25, One of the drawn mental maps by residents (Own work, 2023)

Residents were first asked about the context in which they travel and which modes of transport are available to them. They were also asked wether they visited more places in the city apart from the 6 necessities of the city as described by Monero (2021): living, working, groceries, recreation, healthcare and education. After this small survey, they were asked to draw the mental map. They were then asked about the trade-offs they make when choosing said routes routes and mode of transport. This ultimately made it possible to determine what accessibility indicators they consider when deciding the destination, route and mode of transport.

4.2.1 Transportation in Nieuw-West

The residents provided a clear picture regarding the availability of infrastructure and transportation in Nieuw-West. The modes of transportation that came up were: the car, the bicycle, walking and public transport. The mode of transport which is used the most is the bicycle. Some residents own an electric bicycle while others did not and considered the normal bicycle sufficient. Cycling in Nieuw-West is generally experienced pleasant for a multitude of reasons related to cycling itself. Cycling is experienced as enjoyable, healthy and efficient. Residents also note that having it available precisely when they need it a huge benefit in comparison to public transport. Most of the residents noted that the city centre of Amsterdam is too chaotic to cycle in so they choose other modes of transportation there. Most respondents also noted that bicycles get stolen really often in Amsterdam Nieuw-West which is why they take parking of their bicycle very serious when it comes to choosing transportation. One responded said: *“If I don’t have my electric bicycle in view for more than 30 minutes in Nieuw-West I will choose a different mode of transportation”*.

Public transport, as described before, has not been sufficient in Nieuw-West during the past decennia. However, as the municipality has worked on improving the network, residents are noticing it and are making more use of it. Residents note that the weather partially determines if they use public transport or take the bicycle. When it’s really cold or really rainy

respondents would choose to use public transport. As mentioned before, public transport is preferred in the city centre over the bicycle, however it is not in Nieuw-West as the bicycle is more convenient and comfortable there. Residents note that public transport is widely available in Nieuw-West and protects them from the elements but the negatives outweigh the positives in comparison with cycling. The public transport, especially the bus and tram are considered slow because of their many stops. The amount of transfers residents have to take to reach their destinations is also too many a lot of the time. The consistency of public transport is also something residents take into consideration. One resident noted: *"when I need to be on time during rush hour I avoid public transport as the line I would use is delayed to often at that time"*. The hassle of using it, and to a certain extent the costs, makes other modes of transportation more desirable, like the bicycle and the car.

The car becomes the used mode of transport in cases where public transport is not available or to slow and cycling is not an option because of distance or other personal reasons. Most of the residents note that, in theory, the car is unnecessary in Amsterdam as all necessities are accessible within cycling distance or public transport range. However accessibility of the car beats public transport when it comes to the connection between the West and East districts of Amsterdam. One resident would take 15 minutes by car or 50 minutes by public transport to reach his destination in Amsterdam-Oost. The car is also used when reaching destinations outside of the city especially outside of the 'Randstad' which is well connected by train. One resident notes that his commute to schiphol airport would take 40 minutes by public transport but only 20 by car because the building he works at is not near the main train station. By using the car 5 times a week he saves a couple of hours and thus chooses the car as his mode of transportation. Also, the train and other public transport options to outside the 'Randstad' especially to villages is insufficient as in worst case scenarios the public transport does not reach the destination at all. So when Nieuw-West residents wish to visit those places including friends and family, they become reliant on a personal car. Most residents understand and appreciate that the car is not the preferable mode of transportation in Nieuw-West and notice the municipalities efforts to reduce its usage in the city. However some residents are not too happy with that as the car fulfils desires which other modes of transportation do not. Residents note that in these cases the personal car is preferred over all other modes of transportation when buying heavy groceries or travelling with with less able bodied people. The last disadvantage public transport has in comparison to the car is the costs of using it. In the city, parking makes the car more expensive to use than public transport. However, public transport becomes more expensive extremely quick through train usage and as a result the personal car is preferred a lot of times over it.

Last, walking is well appreciated by the interviewees. Most of the respondents note that walking can be relaxing and comforting, even more so than cycling. It is sometimes used as recreation on its own or while walking towards a destination. Its bonus in comparison to other modes of transport is the minimal hassle. residents can go whenever they desire and do not have to consider parking. Most of the residents choose walking over cycling when the destination is withing a 5 to 10 minute walk because of the easy nature of walking over the efficiency of the bicycle. But some older residents note that because of their time availability they enjoy walking to most of their destination and consider another mode of transportation when they would walk have to walk for more than 30 minutes.

4.2.2 Routing

The residents were also asked what route they take along with the chosen mode of transportation to analyse their experience with the infrastructure network on a macro level. When walking and cycling residents take comfort and relaxation more into consideration than when choosing to use public transport or the car. When deciding to use public transport or the car residents nearly always travel along the fastest route. As mentioned before, residents prefer walking and especially cycling in Nieuw-West. This is mostly attributed to 2 factors, the amount of parks to cycle through, and the separated bike lanes and footpaths. Nearly all residents mentioned that they cycle or walk the route which lets them travel through as much greenery as possible. They say that this is quite doable in Nieuw-West as there are a lot of parks and green areas present. Especially the Sloterpark, central in Nieuw-West host many bicycle paths which most of the residents cycle or walk through multiple times a week. They say that the availability of parks in Nieuw-West greatly improves the enjoyment of walking and cycling. Next to the greenery the parks provide, they also include separated bicycle lanes especially separated lanes from cars. The separated bike lanes out of parks are also appreciated. Residents note that their routes are comfortable to ride as they are mostly separated from fast moving car traffic.

The enjoyment of cycling and especially walking also comes from a general interesting scenery. Notable are the decisions residents made when walking. They avoid busy roads as the sounds, danger and smells are uncomfortable. They make also very small scale decisions like avoiding a petrol station because of the smell or walking certain routes through neighbourhoods because the gardens look nice there. When there is no realistic route which travels through greenery, residents note that the so called shopping streets like the ‘Tussen meer’ are not fun to walk through, they note that there are no stores which spark interest so it just becomes an uninteresting straight line of pavement.

Reactions to travelling in the city centre of Amsterdam have shed light on a problem previously undiscussed. The city centre of Amsterdam is extremely busy which is a combination of limited space and a high volume of people. As noted before, residents appreciate a separated bicycle lane. However they say that the bicycle lanes in the city centre are too chaotic because of eclectic bikes, cargo bikes and scooters. The assumption based on the responses is that the residents experience too many different speeds on their traffic lane which makes it difficult and dangerous to navigate.

The interviewed residents made clear that they feel the most free in routing when walking. They take shortcuts, reconsider routes on the go and base that on current convenience. One resident mentioned: *“I always walk there using this route because the overview I have on that intersection allows me to safely cross a red light”*. They also decide to walk around a street if they see that its extra busy at that moment. This adjustment of routing based convenience on the fly is something public transport and car usage do not offer and cycling to a minimal extent.

4.3 Osdorpplein designed

In what way a space is experienced by users is another integral part of this research. In this part, the study looks into the results gathered from the users of Osdorpplein to understand

what people notice or take into account when visiting a place to analyse accessibility on the micro scale. Because as has been explained earlier, the qualities of a place improve accessibility as the qualities and negative aspects of a place are weighed against each other. Osdorpplein has been chosen to study the factors affecting because of its suggestion of present accessibility factors. How Osdorpplein and its accessibility is designed is elaborated on first after which the results of the empirical research conducted there are discussed.

4.3.1 Development history of Osdorpplein

Osdorpplein is a plaza opened at 21st of October 1964 (Brandeis, 2022). It lies within Amsterdam Nieuw-West, west of the Sloterplas, south of Osdorp Oost and east of Osdorp West, see figure 26.

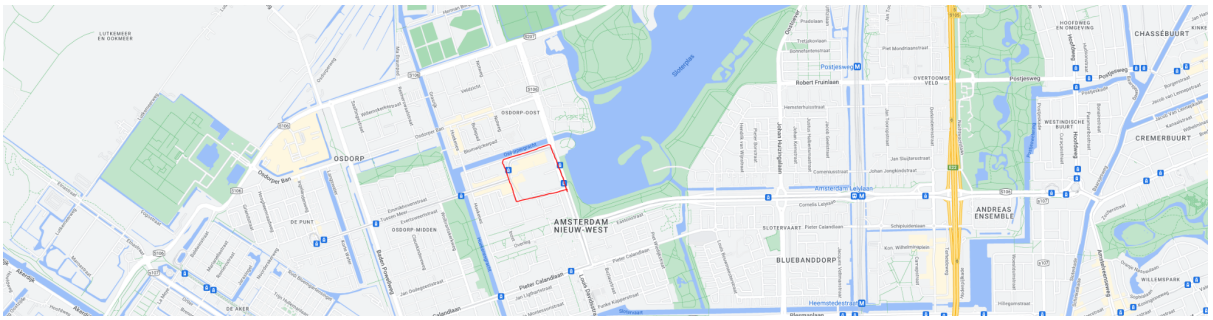


Figure 26, location of Osdorpplein (Google, 2023c)

Osdorpplein was designed as a city centre from the start including various shops and amenities including its most famous artwork “Schaapjes” or better know as “de Lammetjes” by Gerrit Bolhuis. But Osdorpplein was to become a plaza in development. Since its opening Osdorpplein has been redeveloped and improved upon a couple of times. First in the seventies when next tot the existing shops, a theatre was built, ‘Vrije Tijds Centrum de Meervaart’ (Brandeis, 2022). In the nineties, Osdorpplein was further developed to include more shops and more horeca. Around a decennium later in 2004 it still was not the desired plaza the municipality had in mind. Osdorpplein had to become the vibrant and lively plaza which according to the municipality it was not yet. These developments in Osdorpplein can all be linked to the attempt by the municipality to improve the accessibility on the macro scale it is mainly focussed on increasing amount of amenities or and reasons to visit.

The 2004 ambition provides a clear insight into what the municipality sees as hindering in Osdorpplein. Here they shift their focus on to the micro scale of accessibility in Osdorpplein. WPM Consultants provides a publicly available ‘Ontwikkelingsvisie’ or development vision for the area from that time (WPM Consultants, 2004). They note that Osdorpplein needs to be revitalised, or an increase in urban vitality. This was to be achieved mainly by introducing more functions into Osdorpplein like leisure, hotel and offices, again focussed on the macro scale. However these were not the only aspects being addressed.

Before this development vision, urban development agency Khandekar has provided a structural vision regarding the structural planning os Osdorpplein, see figure 27. This vision was was the starting point for WPM to develop a achievable development program for Osdorpplein. It’s ambition was to improve the spatial structure, coherence and amount of

different amenities. So, the municipality classified spatial structure and coherency as indicators of accessibility on the micro scale which needed to improve. What is noted is that this structural vision of Khandekar has not been fully achieved by 2023 as can be seen in figure 28 where the difference between the proposed spatial structure and the realised one is immediately visible.

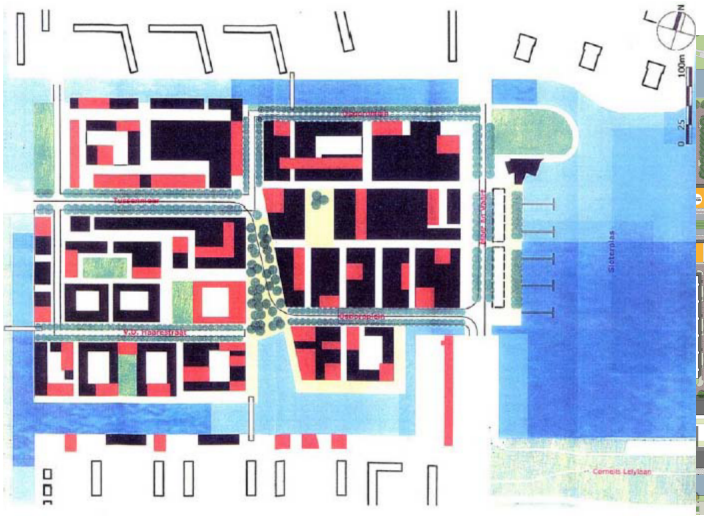


Figure 27, urban vision Osdorpplein Khandekar (Khandekar, 2004)

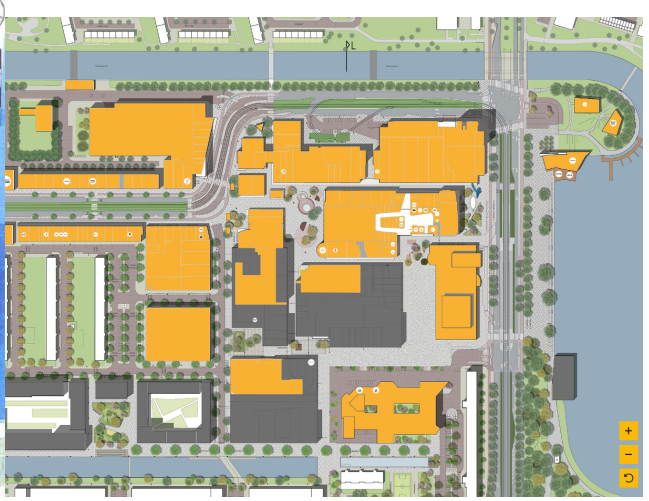


Figure 28, Osdorpplein as of 2023 (Osdorpplein Amsterdam, 2023)

WPM consultants also noted the lack of eccentricity and recreational functions in Osdorpplein (WPM Consultants, 2004). This suggests a lack of Imageability in Osdorpplein as an accessibility indicator. This in combination with a lack of recreational functions suggests that the municipality was aware of the need for a mixed use area to improve accessibility and urban vitality and thus social sustainability.

4.3.2 Osdorpplein current spatial analysis

Figure 29, Osdorpplein plan (Osdorpplein Amsterdam, 2023)

Figure 29 shows Osdorpplein as it is being developed right now. The ‘schaapjes’ exist on the plaza which people note as characterising of Osdorpplein, see figure 30. The coloured benches as shown in figure 31 are placed adjacent to the library and the foodcourt. There are several public transport stops around Osdorpplein from which ‘Osdorpplein oost’ is the busiest as several tram lines and bus lines pass it. There is also ample parking around Osdorpplein in the designated parking garages. Notable is that there is no designated or secured bicycle parking at Osdorpplein.

Figure 30, Schaapjes
(Municipality of Amsterdam, n.d.)

Figure 31 Coloured benches
(Own work, 2023)

4.4 Osdorpplein experienced

Now that the accessibility design of Osdorpplein has been discussed, user perceptions are elaborated upon below. The users of Osdorpplein have been interviewed as described in the research methods in chapter 3. The different answers gotten are shown in the table below, table 4. They are divided into responses relating to the physical accessibility and those towards social accessibility. The distinction is also made between positive and negative comments. It summarises the qualities users experience on the micro scale of accessibility when accessing Osdorpplein.

Table 4, responses Osdorpplein (Own work, 2023)

	Hard infrastructure	Soft infrastructure
Positive	compact, many stores, practical stores, well-maintained infrastructure, many food places, many arabic cultured stores, accessibility by public transport, ease of walking, small scale, free parking, possibility to chain lock bicycles, neat new modern buildings	safe during the day, village feeling with locals, not too crowded, friendly atmosphere, open streets create a feeling of safety, boa's present and camera's feel safe, gatherings are hindered
negative	bad connecting to other neighbourhoods, lack of greenery, feels closed off, only functional, illogical and unclear routes, no more 'licht lucht ruimte', empty and bare, claustrophobic build environment, lacks identity, too much stone and concrete, boring streets, uncomfortable new highrise, buildings have little connection to the street, no outward facing horeca, only franchises and eateries, old flats are ugly, too little light because of tall buildings, no quality/speciality shops	village feeling is gone, no more kids playing, no more dutch atmosphere, people riding bicycles and scooters through Osdorpplein, sometimes too busy, no activity in the evening which creates an unsafe feeling, no feeling of being welcome, no terrasses but only take away, culturally monotonous, no nice atmosphere, loitering youths cause nuisance, no open attitude to social gatherings by municipality, too much construction, garbage on streets, library closes too soon, public transport is too slow with a lot of stops, public transport starts too late.

As can be seen in the table above there are a lot more negative than positive comments. This does not mean that Osdorpplein is experienced negatively in total because the positive comments hold more weight than the negative ones. This can be concluded from the fact that the people were interviewed at Osdorpplein so that must mean that overall the positive qualities were able to convince people to visit Osdorpplein in spite of the negative aspects. A lot of mentioned qualities can be grouped which aids in the analysis.

Buildings and facilities

The buildings in Osdorpplein are mostly newly developed as its amount of inhabitants is planned to increase and the old buildings were not up to standards anymore according to the municipality. The buildings new design gets mixed reactions. Some people appreciate the neat and modern look while others dislike their supposed lack of character and miss the old style. Matter of fact is, the new buildings are taller and house more people. This impacts the amount of sunlight the streets receive which some people take note of and dislike. It also results in some users noting that it feels cramped and disconnected from human scale. See figure 32.

"the 'licht lucht en ruimte' is totally gone"

"I like how there is enough open space to freely move around"

"I am exited to see what stores will open here because it is quite barren as of now"

Figure 32, Empty side street of Osdorpplein (Own work, 2023)

Mixed-use

Apart from living in and around Osdorpplein, a lot of people in Osdorpplein are attracted to the practical stores. Basic groceries, clothing and supply stores are plenty. It is experienced as a useful plaza by many people but enjoyable by less. It also host a lot of food options, especially oriental oriented take away, which draws in a lot of people. However, even though the functional stores and the take away draws a lot of people, a lot of people also comment on the lack of unique stores which reduces their enjoyability of the plaza. See figure 33.

"it is practical"

"There are only only chains here, no fun stores"

"They are only adding eateries"

"the offer in muslim cultural food and stores is great and that's why I come here"

Figure 33, the shopping street connecting to the plaza with the Schaapjes (Own work, 2023)

Urban fabric

Accessibility to accessibility to other neighbourhoods and the logic in the connection of streets and routes within Osdorpplein was considered poor. The urban fabric in Osdorpplein was commented on as unintuitive which does not invite to explore all of Osdorpplein or look further. The lack of clear routing in combination with entrances of Osdorpplien being not well connected to the outside makes traversing Osdorpplein inconvenient. See figure 34 and 35.

Figure 34, open ended Osdorpplein coming from the Schaapjes (Own work, 2023)

"where do I go from Here"

"I only realised you could go further after working here for a month"

"I feel like Osdorpplein is not connected to the area around it"

Figure 35, open ended Osdorpplein towards the Schaapjes (Own work, 2023)

Social mix

There are mixed feelings regarding the demographic in Osdorpplein. Some people living there for a long time dislike the fact that the main demographic has changed to other cultures. The current arabic oriented culture is also experienced as being overwhelming with no to little room for other cultures. However, it is experienced positively by people being part of that culture. They describe Osdorpplein as feeling like a village, like a community while the people not part of that culture mention that that exact feeling has gone. This shows that the positive experience on accessibility of social cohesion has shifted to a different demographic in the area. See figure 36.

"I don't feel part of the community and not welcome"

"It's cosy and the people are nice"

"There should be more cultures represented here"

"I really appreciate the Moroccan vibe"

Figure 36, two older street musicians attracting an audience (Own work, 2023)

Safety and comfort

The open streets and lack of obstructions create a safe feeling for most of the users of Osdorpplein. However Osdorpplein does struggle with some social problems. Especially youths are loitering and disturbing people. There are also problems with people riding (electric)bicycles and scooters through Osdorpplein. The municipality is attempting to combat this by increasing surveillance by BOA's, a subdivision of the police. However they are also limiting in the sense that old people were coming together but got fined for playing music on a speaker. This was not appreciated by the locals. Apart from that, there are no very little functions open in the evening which reduces the amount of people and urban vitality at that moment. People mention that Osdorpplein feels less safe during the evening. See figure 37.

"Old people are lonely, come together and get fined, all the while the municipality promotes looking out for each other as old people get more lonely"

"I won't let my son cycle through here on his own because of the other youths"

"I've been threatened with violence by them"

"I don't come here in the evening as everything is closed and it doesn't feel safe"

Figure 37, A poster by the municipality promoting a safe and clean environment at Osdorpplein (Own work, 2023)

Transportation

The respondents were also asked about their used mode of transport to visit Osdorpplein to gain a small insight in the macro accessibility of Osdorpplein. A lot of people live close by and walk to Osdorpplein. This is because its more hassle to take and especially park your bicycle, including the fear of it being stolen, which is amplified by the fact that a lot of people in Nieuw-West own an electric bicycle. Multiple users specified the need to park the bicycle safely or at leas with two locks. People are generally content with the public transport towards Osdorpplein. However when coming to Osdorpplein from another city its faster by car as you have to make a lot of transfers, from train to tram etc.. It has to be noted that it was quite windy during most of the data collection moments and a lot of people responded that they would take the bicycle normally but now chose the tram. See table 5

Table 5, Modes of transport used to visit Osdorpplein (Own work, 2023)

Mode of transport	Frequency
Car or Motorcycle	4
Public transport	17
(Electric)bike	13
Walking	14
No result	2
total	50

"I dislike that they are going to remove free parking"

"I am taking the tram because its so windy, normally I take the bicycle"

Chapter 5: Discussion

In this chapter the findings are discussed and limitations are mentioned. The next chapter, the conclusion and recommendations, covers the answer to the main research question and recommendations for further research and practice. This study has conducted research using multiple research methods including a literature review, a study into case study documents and subsequent in-depth interviews with project managers, in-depth interviews with residents and street interviews with passers-by. For this research, a literature review was sufficient to explore the concepts of the 15-minute city and social sustainability. Accessibility was studied as part of the literature review and further researched during the empirical study. This was to aid in the understanding of experienced accessibility as previous research into the subject was deemed insufficient. The interviews with functionaries and interviews with users have provided a deeper understanding of the truly affected accessibility by users. This deeper understanding has aided in answering the main research question: *To what extent is the 15-minute city able to enhance social sustainability?* This understanding of accessibility was necessary to evaluate the effect of the implementation of the 15-minute city on accessibility and by that, social sustainability.

Social sustainability in literature

The literature research into social sustainability has revealed a list of indicators in the built environment which impact social sustainability. They are mostly split between indicators related to the built environment itself and the people inhabiting it, hard and soft infrastructure. This division of indicators seems logical as it differentiates between indicators which can be designed directly, the hard infrastructure, and the indicators which have to be designed through the users, the soft infrastructure. However, even though literature sets these indicators as true indicators affecting social sustainability, social sustainability could be considered a feeling, relating back to its initial definitions which note it being the quality of life. Quality of life is subjective so it could be considered presumptuous to assume that the indicators found are first, equally relevant and second, conclusive. It also has to be noted that quality of life is influenced by more factors than just accessibility in an urban context, including for example personal factors. This limitation has to be taken into account when evaluating the impact of the 15-minute city on social sustainability.

15-minute city in literature

Literature research into the 15-minute city has fostered the problem statement, and therefore also the hypothesis of this research. The 15-minute city appears to be ideal on a surface level, but its negative impact on accessibility and thus on social sustainability is overlooked. This was confirmed by the empirical study of this research as users noted indicators of their accessibility which would be negatively affected by the implementation of the 15-minute city. The 15-minute city as a main concept has shaped the perspective from which the other concepts, social sustainability and accessibility have been researched which limits the research as both those concepts could have been researched from other perspectives as well.

Accessibility in literature

As mentioned before, accessibility has been studied using multiple methods but initially through a literature review. The accessibility of a space is overlapping with the experienced social sustainability at that location. Some examples are the feeling of safety and social cohesion as well as access to walking attractors and building typology all being indicators of social sustainability in an urban context and the accessibility thereof. The distinction between soft and hard indicators is also made in the same way as it is presented for social sustainability. Accessibility has also been split up in accessibility experienced on the macro and micro scale and it seems that the indicators of accessibility on the micro scale are much more pronounced and concrete than the indicators of social sustainability. For example, accessibility on the micro scale is improved by having a open facades in buildings. Social sustainability is more abstract where the total building typology affects social sustainability and thus is not per definition positively affected by one aspect. However, it does confirm that accessibility is able to affect social sustainability to a great extent. An initial limitation of this study is that accessibility has been discussed in a spatial context which limits the perspective of the research as there are more perspectives to analyse accessibility from.

Accessibility through multiple research methods

The literature has shown the indicators which affect accessibility according to previous research. The other research methods were implemented to confirm, disprove or add to those findings. The case study of Amsterdam Nieuw-West was chosen and case study documents and interviews with project managers were conducted to gather information on what functionaries thought were the indicators of accessibility affecting the accessibility experience in Nieuw-West. It could be considered that results from this part of the case study are from the same perspective as the findings in literature because both of those findings are gathered from professionals in function describing the experience of end-users rather than the end-users describing it themselves. This creates an interesting dynamic between conflicting data as it then becomes the question whether to take the results from the interviews with users, or the results from the perceived user experience by professionals, as truthful.

Accessibility on the macro scale

Accessibility from the perspective of the macro scale has been defined as accessibility to a place. This level of accessibility has to do with the availability of amenities and infrastructure. It immediately surfaces a limitation of this research which comes from the fact that accessibility could be studied on more scales than just the defined macro and micro scale. On the macro scale, the research methods confirm each others results to a large extent. Comfort is, next to proximity, the most important factor in macro accessibility. Comfort during small commutes by bicycle or by foot are benefited by a multitude of factors: feeling of safety, separation from cars, urban vitality, available greenery and availability of amenities to name a few. The impact of the street network on the accessibility experience is where the sources disagree. The project managers noted the chaos of the street network in Nieuw-West and its negative impact on accessibility which is supported by literature. The interviews with residents in which they drew a mental map showed no sign of this supposed chaos of the street network while they did note the quality of the bicycle and walking infrastructure in Nieuw-West. They also noted the chaos of cycling in the city centre of Amsterdam which they related to the different speeds of traffic in the little space available. This means that residents are aware of comfort when cycling in different environments but

the findings suggest that in that regard, Amsterdam Nieuw-Wests street network is experienced better than functionaries believe and that other chaos inducing factors are more important when cycling. This is interesting for this case study specifically, but this also suggests that the in-depth interviews with mental maps were able to provide data more truthful to the accessibility experience than the study into case study documents and interviews with project managers. This is backed by the fact that the literature and the case study documents nor the project mangers noted the great desire for bicycle parking in Nieuw-West even though the residents clearly noted the desire in nearly all the interviews. They mentioned that they carefully consideration their parking options for their bicycle when visiting a place in Nieuw-West. The interviews with passers-by on the street confirmed this as a lot of people in those interviews also noted their need for safe bicycle parking. Another surprising find was the desire for car usage. Multiple people during the interviews and street interviews noted their need for a car even though literature and the municipality suggest that car traffic should be decreased to improve accessibility for other types of mobility. These respondents noted situations for which they need a car due to personal circumstances which could not be fulfilled with other modes of transportation. Most examples involved concerns regarding physical and social safety issues related to alternatives, reasonable availability of alternatives and limited physical capabilities. These findings suggest that the car is still a necessary mode of transportation in the city.

Accessibility on the micro scale

Accessibility from the perspective of the micro scale has been defined as accessibility of a place. This level of accessibility has to do with the accessibility factors which hinder or benefit the accessibility of a place itself. The research methods confirm that comfort and quality are important factors of accessibility on the micro scale. This relates to the need for greenery, safety and a logical street scape. Passers-by noted a feeling of being lost in Osdorpplein and the municipality is aware of that, so they have attempted to reduce this by improving logic in the streetscape. It hereby confirms the usefulness of the Puccinimethod by the municipality to simplify the streetscape as users note their content with a clear and logical public space. However, the findings suggest that literature lacks understanding of the impact of social cohesion and urban vitality on the access of a space. Passers-by and the municipality note the distinct demographic of Osdorpplein as most residents come from a non-Western background. This identity of Osdorpplein enhances the accessibility for people associating themselves with that identity while it limits that of those without it. The findings suggest that this also impacts social sustainability by itself next to its initial impact on accessibility. It is thus considered that this has an important role in applying 15-minute city ideas like diversification of neighbourhoods. The identity of a place plays a big role in accessibility as a preferred identity is subjective. The identity of Osdorpplein is greatly affected by social cohesion and urban vitality also greatly affects identity. Residents and passers-by commented on their preferred living conditions with a lot of them enjoying the peace and quiet of Nieuw-West and being close to greenery. They enjoyed their own space while being close to their necessities of the city. It must be noted that catering districts to different users is not something newly presented by the 15-minute city as areas automatically cater to its users as they attract each other. It could be argued that this phenomenon is discriminatory in nature as seen in Osdorpplein where different demographics do or do not feel welcome or catered to based on their background. To conclude on which basis this differentiation of districts is justified is beyond the limitations of this research.

Limitations of research scope

This research has limited transferability because of its scope. This research is a masters thesis and was thus conducted by 1 student in a limited time frame. The result is that the empirical data is gathered from one case study with a limited sample size. It can not be confirmed whether the data also applies to other case studies. As mentioned before, the perspective is also a limitation of this research as this research was initially aimed at the application of the 15-minute city. The main concepts and data collection have all been examined through this lens. The researcher is aware that other perspectives exist but and have to be taken into account to not apply findings found in this research in other contexts. Another clear limit of this research is the psychological aspect of the interpretation of data from the interviews. The researcher has taken the responses of the interviews at face value but understands the possibility of underlying factors affecting the responses. Unfortunately it is beyond the limitations of this research to analyse the answers beyond their original meaning to find still hidden factors affecting the initial responses of interviewees.

Chapter 6: Conclusion and recommendations

6.1 Conclusion

The main research question which this research sought tho answer is: *MRQ: To what extent is the 15-minute city able to enhance social sustainability?* The answer is found by evaluating to what extent the indicators of the 15-minute city influence accessibility. Because the 15-minute city aims to enhance social sustainability by improving accessibility it is surprising to conclude that the 15-minute city concept as described in literature is not able to enhance social sustainability in a city.

The research recognizes that this conclusion is quite harsh and controversial as the 15-minute city is recognized by many as a solution to socially sustainable cities. However the findings suggest that indicators of the 15-minute city do indeed enhance social sustainability. But the crux lies in the fact that the 15-minute city applied as a whole concept goes against the fundamental principles of the right to the city and spatial justice which comes from the complexity of social sustainability as a concept.

Social sustainability has been defined as quality of life and quality of life is affected by many different factors outside of spatial planning which were brought up during the interviews with residents and passers-by. The most influencing factors being the reduced access for car traffic and the mixed use zoning as indicators of the 15-minute city. As shown in the findings, not accommodating to car traffic in the city excludes participation to some inhabitants as it is their only reasonable mode of transport in some instances. The ideal image of the 15-minute city including people on cargo bikes riding transporting goods and people always being able to reach their destinations by bicycle or foot is an ideal image not taking in the complexities of diverse human needs and capabilities. Certain demographics would be homestuck if their car travel would be taken away which goes against spatial justice and thus social sustainability. Another finding which conflicts with the 15-minute concept is the identity preference. The 15-minute city sees the city become one entity of mixed use spaces. However this skips over the fact that some people enjoy simplicity in their living environment. By only accommodating for people in the city who thrive in the complexity of mixed use spaces, people who enjoy relative quiet neighbourhoods in cities are excluded from participating. In the findings it is noted that districts in cities have always have different identities which could be discriminatory. However, it cannot be concluded that there are inhabitants in those situation who do not have a space fitting to their identity. But, by implementing the 15-minute city, one specific part of an identity related to spatial planning is forced upon inhabitants which does discriminate against people not desiring to conform to that identity. So in conclusion, the 15-minute city will worsen social sustainability to a certain extent rather than improve it.

6.2 Recommendations

The notion that the 15-minute city concept reduces accessibility and therefore worsens social sustainability should be considered with some nuance. Indicators of the 15-minute city like human-focussed design, increased greenery and more mixed use spatial planning to some regard does improve accessibility and thus social sustainability as is proven by the

findings of this research. So this research still recommends improving accessibility in cities by indicators of the 15-minute city, but it should not be used a one size fits all solution for all inhabitants because social sustainability is a personal experience which is not always improved by the 15-minute city concept.

This research has shown that there is a disconnect between the perceived accessibility experience of inhabitants by the municipality and the results from the study with inhabitants into the experienced accessibility of the inhabitants. The in-depth interviews with residents utilising mental maps were time consuming but proved an incredible tool to understand the whole decision making process regarding accessibility. Also the street interviews proved extremely useful for understanding the accessibility experience of users as passers-by were interviewed in their function as an user of the public space. Both these research methods proved that interviewing users in function of being a user provides the most truthful data on the user experience in contrary to conventional methods like conducted analyses by functionaries. These direct methods used for this research are promoted by urban sociologists as well to spatial planners and other officials for their usefulness. This research further proves the usefulness of these research methods for empirical studies related to the user experience. Further research into the subject of accessibility experience in Nieuw-West could include more case studies and categorization of different demographics to find different accessibility experiences linked to certain demographics.

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Appendix I: Reflection

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Hand in date: 23/06/2023
Title of thesis: Accessibility enhancement by the 15-minute city in Amsterdam Nieuw-West

To start of, I believe my approach worked because I am able to answer the main research question sufficiently. The “how” in my process is based on the purpose of my research, the empirical research into understanding accessibility to then apply that knowledge to the 15-minute city concept, which is the “why”. This is done because increased accessibility is the main driving force to enhance social sustainability by the 15-minute city. Through this empirical research, talking to residents, talking to passers-by, I am able to confidently say that there are very little hidden factors impacting accessibility left (leaving aside limitations to the research based on research capacity). I wanted to understand the trade-off process people make in relation to the experience of accessibility in Nieuw-West. This means that by interviewing the users directly, I had to deal with the least translation and transfer of information and opinions possible (the only limit could be the honesty of the respondents but I have no reason to doubt that). The only thing that bugs me is the survivorship bias during my interviews in Osdorpplein. I do not know which factors actually prevent people from visiting Osdorpplein as I was not able to meet those people on Osdorpplein.

The feedback given by the mentors was mostly related to which direction I should take my research. This was mostly about main concepts and the elaboration upon them especially during the literature. My conceptual model changed a lot because I kept being dissatisfied with it and kept asking for guidance. However after many iterations, I am in my final stages happy with my conceptual model. It helped that my mentors noticed that what I was doing was right, as in working towards my research topic, but that the labelling seemed incorrect in the conceptual model. In terms of data collection, my main mentor advised a lot on proactively approaching residents and institutions to get in contact with. However I limited myself in that regard as I felt a barrier approaching institutions and “professionals” with whom I have no previous connection as long as I am not confident in what I am doing. I did not approach a lot of people and institutions my main mentor provided me because of my uncertainty regarding my concepts and how they would connect. Lucky for me though, my data collection worked out in the end even though I did have a lot of trouble finding respondents. The trouble finding respondents, especially for the hour interviews with residents, led me to changing my approach. Because of that I started interviewing people on the street in Osdorpplein which in the end led to a better understanding of accessibility and its two scales and thus a better approach. My initial idea was that I needed long in-depth interviews with residents to scrape the bottom of the barrel of how people experience accessibility. But the shorter interviews in Osdorpplein showed me that I would receive similar information as the in depth interviews on a different accessibility scale if my sample size would be bigger. In the end, the results confirmed each other even though the interviews with residents were more route focussed while the results of the interviews in Osdorpplein were more focussed on the location itself. So I could have done a bit more with that specific feedback but in the end I am happy with how it worked out. The other feedback related to structure and content I took very serious and implemented most of the time after

consideration. What I've learned from my own work is indeed the approach part of research. This time it worked out but if changing my approach was not an option I would have had to be more active into approaching people, or more assertive in that regard. Instead I started waiting the moment I had send all my emails and after they did not return anything. I became fully reliant on my last connection, which worked out but it was to much of a risk in hindsight.

The relation between my graduation project topic and my master track Management in the Built Environment is the conscious understanding of how we desire to use the built environment and how it connects to our daily lives. One discipline of MBE is REM or Real Estate Management. It is about the analysis of situations in the built environment, discovering the problem within, and then building towards a solution.

My research initiated with a fascination for the 15-minute city and an enjoyable public space. So I started researching what that meant and connected the concepts: 15-minute city, accessibility and social sustainability. So that was what I was going to look for during my study and use as a basis to comment on the implementation of the 15-minute city concept. During my research I changed my approach from (then unbeknownst to me) mostly route focussed to also location focussed. Which did help in providing recommendations based on what people experience in a space.

I value my way of working quite high. I was able to built a literary basis before really diving into the empirical research of this thesis. This provided the framework of indicators for which I had to look out for when interviewing people in my case study. However I feel like the results from the interviews are a bit lacking as there are some biases at play. I also feel like this research needs a follow up, making use of a survey, and require way more respondents as then the results can be quantified and we can measure what the majority of people thinks about accessibility to then apply to a similar research question. In hindsight maybe the 50 interviews in Osdorpplein were the best way to study the subject of accessibility as the accessibility of the majority will be taken into account when designing public space. However I did start this research to explore the niches and the things we do not see about the accessibility experience of people. So no, I am glad I conduced in some depth interviews and a lot of surface level interviews, however I am a bit disappointed that the in-depth interviews did no result in extreme or interesting niches.

I think my thesis sets a preliminary baseline for further research regarding accessibility and application of the 15-minute city. As the 15-minute city is a recently articulated concept and municipalities are starting to catch on. With the empirical research applied in my research we got the baseline to then work from on how ideas present in the 15-minute city can be applied. This should accelerate the debate on what is the right way to process city design. The scope and implications of this research are somewhat limited as the case studies applied are context sensitive. There are general lines to drawn about what people do and do not experience regarding accessibility and how the 15-minute city idea has to fit with those experiences. But also because this is a masters-thesis and thus it will probably collect digital dust in the repository of the TU Delft it would not have much reach. However I am going to present my findings in the Van Eesteren museum which might bear some fruit for the city of Nieuw-West.

As mentioned earlier the transferability of my results is something im very conscious about. I am uncertain as to the extent to which my results depend on the context. I do believe they are somewhat transferable as especially in Osdorpplein as the sample size has approached a sufficient number of respondents. However because of the biases in selecting and receiving respondents I must admit that the results gathered have to be interpreted towards different demographic groups. Which is because I realise that I was not able to get respondents from each demographic visiting Osdorpplein or living in Nieuw-West. So it is difficult to draw conclusions regarding the accessibility wishes from different demographic groups in Nieuw-West.

The sixth reflection question is: to what extent was I able to elaborate on previously underdeveloped subjects. This is specifically applicable to my thesis in the sense that accessibility as a concept has been developed throughout the whole graduation process. It started off as a subject to research splitting physical accessibility and social accessibility. The former being the literal ability to access a place yes or no and the latter being the whole experience of accessing a place. However during the data collection and the further development of the research I also noticed the need for elaboration on two levels of accessibility, macro and micro, Amsterdam Nieuw-West as a whole and Osdorpplein. Which was then afterwards elaborated upon in my earlier literature review which required me to further research these levels. It also made sure that I reevaluated my way of splitting physical and social accessibility which has been elaborated upon on the basis of a later written part regarding social sustainability. So my initial understanding of my concepts was changed during the process and redeveloped during the later, last, stages of my thesis writing.

The seventh reflection question is: To what extent is the P4 report going to differ from the P5 report. The P4 report must be awarded a pass and thus a 6 to start on the P5 report. So it is unlikely that the reports will differ a lot. The P4 report must include all the content that is necessary to answer the research questions. What might be improved upon is the way this content is used in the discussion and in the conclusion. The conclusion must be correct in relation to the literature review and data collected, however it might be possible that it needs extra elaboration on certain aspects to further substantiate the main conclusion. Something else that will certainly be improved upon is the academic writing level and layout as that is something I personally struggle with and is not my main concern for handing in my P4

In the end I am happy with my results and proud of my work.

Appendix II: Operations table of the research

Operations table of this research (own work, 2023)

Research sub-question	**Concept**	**Indicators**	**Data collection method**	**Sources**
SQ1	Social sustainability	Hard and soft infrastructure	Literature research	Research databases
SQ2	15-minute city and accessibility	Physical and social accessibility on the micro and macro scale	Literature research	Research databases
SQ3	Accessibility designed in Amsterdam Nieuw-West	Physical and social accessibility on the macro and micro scale	Interviews with project mangers and case documents	Personal network and website of the municipality of Amsterdam
SQ4	Accessibility experienced in Amsterdam Nieuw-West	Physical and social accessibility on the macro and micro scale	Surveys and interviews with residents and users	Residents at the van Eesterenmuseum and people on the street at Osdorpplein

Appendix III: Interview subjects project managers

*the original document is in dutch

To be discussed subjects

1. Introduction PM
2. Development of Nieuw-West with the AUP as its basis
3. Growth and redevelopment of Nieuw-West in relation to the Municipality's densification strategy
4. Amsterdam Nieuw-West in relation to the concept of the 15-minute city
5. Accessibility in Nieuw-West
6. Network improvement in Nieuw-West
7. From a car-focused district to a car-free district
8. Greenification in the city
9. Puccini method
10. "Make sure there are plenty of places, both in public space and built space where different groups in the city can feel at home" (Omgevingsvisie pg. 40)

Appendix IV: Interview questions residents of Nieuw-West

*the original document is in dutch

Small talk

Before we begin this interview, I would like to remind you that participation is completely voluntary and can be stopped at any time. Should you choose to stop your participation in the study, the answers given up to that point will be deleted.

To reiterate on the informed consent, in this study I am conducting research on accessibility as a student. This is to establish a link between the 15-minute city and social sustainability.

The 15-minute city is a city in which all amenities of the city can be reached within 15-minutes by walking or cycling. These amenities are living, working, school, shopping, healthcare and entertainment

This interview will start with a short questionnaire after which, by drawing a mental map, we will try to discover the factors that influence your accessibility. This whole interview will take about 45 minutes

Are there any questions at this point? if not we will start the survey

Introduction

- what keeps you busy in your daily life? in terms of work, hobbies etc.
- What is your age range ten years+

Survey

City

1. In which city, district and street do you live?

2. How long have you lived there?

3. Do you go to school in New-West?

4. Do you work in New-West?

5. Do you do your shopping in New-West?

6. Do you receive care in New-West? GP, physio, dentist, pharmacy

7. Do you seek recreation in Nieuw-West? hobbies, making music, sports, but also terraces, cinema or nature?

Transport

8. What means of transport do you have at your disposal or do you ever use?

9. When do you use the car and what are the advantages and disadvantages of using it?

10. When do you use a bicycle and what are the advantages and disadvantages of using it?

11. When do you use public transport and what are the pros and cons of using it for you?

12. When do you use ... and what are the pros and cons of using it for you?

13. When do you use ... and what are the pros and cons of using it for you?

Context

14. Do you have children and/or a partner

15. Do you ever travel with them?

16. Do you ever travel with others not from your family? Think with a child or with a friend

17. Does the time of day affect how you travel, if so how? Think in the morning during the day or late at night

18. Does the weather affect your travel?

Metal map

Drawing

Now I am going to ask you to draw a mental map.

1. Would you draw your house in the centre of the sheet of paper?
2. Then roughly outline the part of town you live in.
3. Then where you work, (if this is outside this district approximately in which direction outside the outline of the district)
4. Same for the rest. all destinations
5. Please draw your route to work
6. Same for the all destinations

Questions work

1. What means of transport do you use to get to there and why do you use them?

2. How did you get to this route and what do you encounter there?

3. Is this the fastest way to get there and what are your reasons for taking this route?

4. Are there other logical routes possible to this location(s)? why, why not? what do you encounter on those routes?

5. What are the reasons you don't use the other means of transport at your disposal?

6. Why don't you choose to go by another means of transport via the alternative routes?

Questions education

7. What means of transport do you use to get to there and why do you use them?

8. How did you get to this route and what do you encounter there?

9. Is this the fastest way to get there and what are your reasons for taking this route?

10. Are there other logical routes possible to this location(s)? why, why not? what do you encounter on those routes?

11. What are the reasons you don't use the other means of transport at your disposal?

12. Why don't you choose to go by another means of transport via the alternative routes?

Questions shopping and groceries

13. What means of transport do you use to get to there and why do you use them?

14. How did you get to this route and what do you encounter there?

15. Is this the fastest way to get there and what are your reasons for taking this route?

16. Are there other logical routes possible to this location(s)? why, why not? what do you encounter on those routes?

17. What are the reasons you don't use the other means of transport at your disposal?

18. Why don't you choose to go by another means of transport via the alternative routes?

Questions healthcare: dentist, physiologist etc.

19. What means of transport do you use to get to there and why do you use them?

20. How did you get to this route and what do you encounter there?

21. Is this the fastest way to get there and what are your reasons for taking this route?

22. Are there other logical routes possible to this location(s)? why, why not? what do you encounter on those routes?

23. What are the reasons you don't use the other means of transport at your disposal?

24. Why don't you choose to go by another means of transport via the alternative routes?

Questions recreation, hobby's, sports and nature

25. What means of transport do you use to get to there and why do you use them?

26. How did you get to this route and what do you encounter there?

27. Is this the fastest way to get there and what are your reasons for taking this route?

28. Are there other logical routes possible to this location(s)? why, why not? what do you encounter on those routes?

29. What are the reasons you don't use the other means of transport at your disposal?

30. Why don't you choose to go by another means of transport via the alternative routes?

Appendix IV: Interview questions users of Osdorpplein

*the original document is in dutch

Approach user

1. Are you from this neighbourhood?

Explain purpose

2. Why do you visit Osdorpplein?
3. What mode of transportation did you use to get here?
4. Why did you choose that mode of transportation?
5. Do you think it is convenient to walk in Osdorpplein?
6. What do you consider qualities of Osdorpplein?
7. What would you say could be better at Osdorpplein?