

Dioptase Horizons

Envisioning a biophilic
blueprint for Zwolle's future

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Urbanism MSc 2024



Colophon

Dioptase Horizons:

Envisioning a biophilic blueprint for Zwolle’s future

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Acknowledgement

I feel fortunate enough to be able to close my academic chapter with this project, in which I found not only my interests but also a lens to see the world through. I never imagined that working with nature and trying to understand it would be so interesting. It has been an amazing journey trying to find out what type of designer I want to be.

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Abstract

This graduation project aims to address the pressing issues of climate change, the population growth and population shifts, as well as the housing crisis that is simultaneously created, in the Dutch context. As cities in the Netherlands are facing shortages in housing, more and more strategies are being created on a National and a Regional level to tackle this problem. In order to build more homes, less space need to be given to nature in the urban environments. As a result, cities and their inhabitants, are vulnerable against the effects of climate change. The quality of life shrinks, although the environment to live in grows.

Zwolle, is one of these cities: as the capital of the province Overijssel, the city is prompt to grow in the next decades, and is already conducting strategies to accommodate the population growth. A number of strategies and plans have been created to address the housing crisis, and yet, the natural elements come as “additions” to them. More people in houses means also more people in the public space. So how do we create green vibrant public spaces when the priorities lie in tackling the housing demand?

This graduation project is in the search of a new strategy for integrating nature into Zwolle’s urban environment, by using the “3-30-300” rule by Dr. Cecil Konijnendijk. This tool provides simple and measurable guidelines to integrate green spaces into the city, to provide better quality of life and create climate resilient environments.

Focusing on the Kamperpoort neighbourhood of Zwolle, which is susceptible to the effects of climate change (Urban Heat Island Effect, flooding probability, etc.), due to lack of accessible green spaces, the projects aims to create a design framework that prioritises the human-nature relationship, fostering the creation of a city that is healthy, liveable and resilient.

Key words: 3-30-300 rule, Zwolle, green space, healthy city, livability.



Figure 1: Photo of Zwolle

Source: Author

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Figure 2: Tree-lined street in Rotterdam

Source: Author

Chapter 1

Overview of the project

Nature and natural environments have been under pressure and destruction from both human and non-human activities over the past century.

Humans have neglected the importance of nature leading it to a “downfall”, as not only natural environments are being destroyed across the globe, but little to no measures are being taken to restore nature and assist it into becoming more resilient.

1.1 Introduction

The world is changing rapidly: climate change and humanitarian crises lead to uneven shifts of the population around the globe, creating grounds for rapid urbanization in many areas (Weinthal et al., 2023). Temporally structures are created in order to accommodate more people, but essentially cities have realised that these issues will continue to grow over the next years, and as a result, cities must also grow. In previous decades, in conditions where the city needed to accommodate more people, they expanded. But nowadays, the lack of ground to expand is prominent, and priorities have shifted. Cities can no longer continue to expand, as this will lead to occupation of land necessary for agriculture, wild life, industrial areas, etc.

With the priorities changing, and the main goal being to accommodate as many people as possible in the urban fabric, means that every available plot of land inside the city's boundary will be redirected to be built up. By doing so, a new norm has started to emerge: denser cities with higher buildings. But more people and buildings, means also more people in the public space of the city: streets, parks, plazas, playgrounds and squares will also be flooded with more people walking, biking, riding a car or the public transport and interacting with each other. So, it is important that people are able to also stay outside of their apartments, socialise, run, walk, sit on a bench, enjoy their everyday life and their everyday environment.

The trend of building up every available plot, or when demolishing, also building high rise buildings, undermines often the natural environment of the area, by leaving no space for nature or green infrastructure. People need greener environments in their life, in order to have a better quality of life, and re-connect with nature. Seeing land only as a means to grey-ing the city instead of green-ing it, challenges not only the ecological/natural system of the city, but also the physical and mental health of people.

It is evident, that the way we built our cities can have not only positive but also negative effects, for both people

and nature (UN HABITAT, 2022). In the context of the Netherlands, rapid urbanization has occurred in most of the Dutch cities, leading to a severe housing crisis, that with its turn lead people to seek accommodation in cities less urbanised, towards the East of the country. At the same time, the country needs also to address the flooding probability in the next 20-30 years due to the melting of the ice caps, severe rainfalls and sea level rise, that can lead to loss of land.

Today's cities are facing all these challenges combined: Climate change threatens the liveability of the cities, as rising temperatures, extreme weather conditions and the urban heat island effect are creating conditions that affect the well-being not only of human but also non-human species. At the same time, the population is growing but also shifting around the globe, leading to cities overcrowding, impacting also the quality of life. And lastly, the housing crisis in the majority of cities pushes for development of new constructions, leading to degrading the natural environment and prioritising human needs, creating a series of challenges for both people and their environment they live in. For example, lack of green spaces in the urban fabric leads to higher temperatures, less shade, poorer quality of air, and a vulnerable ecosystem of species (Callum Mair, n.d).

But why do we actually need nature in our urban areas?

We, as human being are naturally drawn to nature, according to E.O. Wilson, who developed the biophilia hypothesis. This theory is rooted in the evolutionary history of humankind, as it suggests that humans have an inherited need to be connected to natural environments, a "relationship" that has been developed since the beginning of time (Wilson, 1984).

In the recent years tho, this is questions of the importance of nature in the urban environment, has been getting attention more and more in the last years. Dr Cecil

Konijnendijk is a Professor of Urban Forestry at the University of British Columbia (UBC) and director of the Nature Based Solutions Institute in Wageningen, studies the role and importance of nature in cities and explores how we can create healthier cities with the help of integrating green into them (Callum Mair, n.d).

In 2021, Dr. Konijnendijk C., developed a new paradigm for creating healthier and greener cities, called "3-30-300" rule which states that:

- Every city resident should be able to see at least three trees of quality from their home
- Every neighbourhood should have at least a 30% tree canopy coverage
- Every city resident should have access to a green space within 300 meters, of at least 1ha in size (Browning et al., 2024).

This rule provides a set of goals that can be measured not only by stakeholders but also by citizens, setting a stage where everybody can grasp the importance of nature in the city but also its benefits. The 3-30-300 rule has the basis of a growing body of research and knowledge, that has been developed over the centuries, emphasizing on the importance and benefits of trees and green spaces, in relationship to proximity (Browning et al., 2024).

This report seeks to investigate how nature and green fits into the equation of "climate change + population growth + housing crisis = --> built more on land --> less space for green and nature --> impact on public space, health of people and ecology.

To understand in depth the crises and the importance of nature, specifically in the Dutch context, the city of Zwolle will be used as a case study with the main research question of the project being:

"What if the biophilic design strategy of Dr. Cecil Konijnendijk would be implemented in the streetscape of Zwolle to improve the existing public space by 2100?".

Zwolle, is a growing city, facing multiple challenges, which needs to be addressed, in order to shape a city that is sustainable and resilient for the future. Many neighbourhoods of Zwolle, do not have direct access to public green spaces, creating vulnerable communities. One of these neighbourhoods is the neighbourhood of Kamperpoort, which is chosen to apply the 3-30-300 rule with the method of research by design, to understand how small design interventions are the basis for change a city needs.

Lastly, this project seeks also to contribute to the creation of a new design based framework for neighbourhoods in Zwolle, in which people and nature are the priority of every spatial decision and are viewed as an interconnected layer. By understanding the importance of the symbiosis between people and nature in the urban fabric, new ideas can be developed to better design a city in a way where the natural elements not only enhance the well-being of people, but also protect the city and provide a first step of resilient development.

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The case of Kamperpoort neighbourhood located in Zwolle is chosen to apply the research through design method, and understand how small design interventions are the basis for change a city needs.

1.2 Project motivation

Growing up in Katerini, a small city located on the North side of Mount Olympus, in Northern Greece, living with nature was a fact. Having Mount Olympus to explore the wild nature during my childhood, and the sea on the East side of my hometown, shaped me as a person in different ways. Although the city itself is surrounded by nature, in the urban fabric you cannot spot areas, except from two major parks, that do not have any ecological value.

After moving to the Netherlands, the nature of the country fascinated me: it was different from what I have been used to, and yet, so beautiful. The type of nature I experienced in different Dutch cities always made me feel calm and happy, regardless the urban tissue.

During my first year in the MSc of Urbanism, I explored many projects in different scales and they always had one aspect in common: nature. So how do we work with nature? What are the benefits of having nature in the city? Questions that require extensive discussion.

Starting my second year, and having gained enough knowledge on the world's emerging problems, I started to imagine how would the city of the future look like? Would it be the same in all the countries? Will the rapid urbanisation process create cities like we see in dystopian sci-fi movies? Naturally, I wanted an answer to my questions, and thus, this graduation project started to come to life.

I started questioning the way we design as professionals, outside of academia. All of our years of training we are taught to design for the communities, keeping sustainability in mind, incorporating natural elements in our ideas, but in reality,

this is not always the case. The world is driven by economic and political forces that do not always allow us to be critical and sustainable and green in our design as urban designers. But maybe change is needed.

This change may not come now, or in the next years, but it is important to start making steps for his change to happen. Simple explanations, weighing the positive and negative aspect of what we design, so every stakeholder involved can be eventually convinced.

I started this project with a simple question: ...but what about nature? and this question is the first one I will always be asking myself for every current and future project.

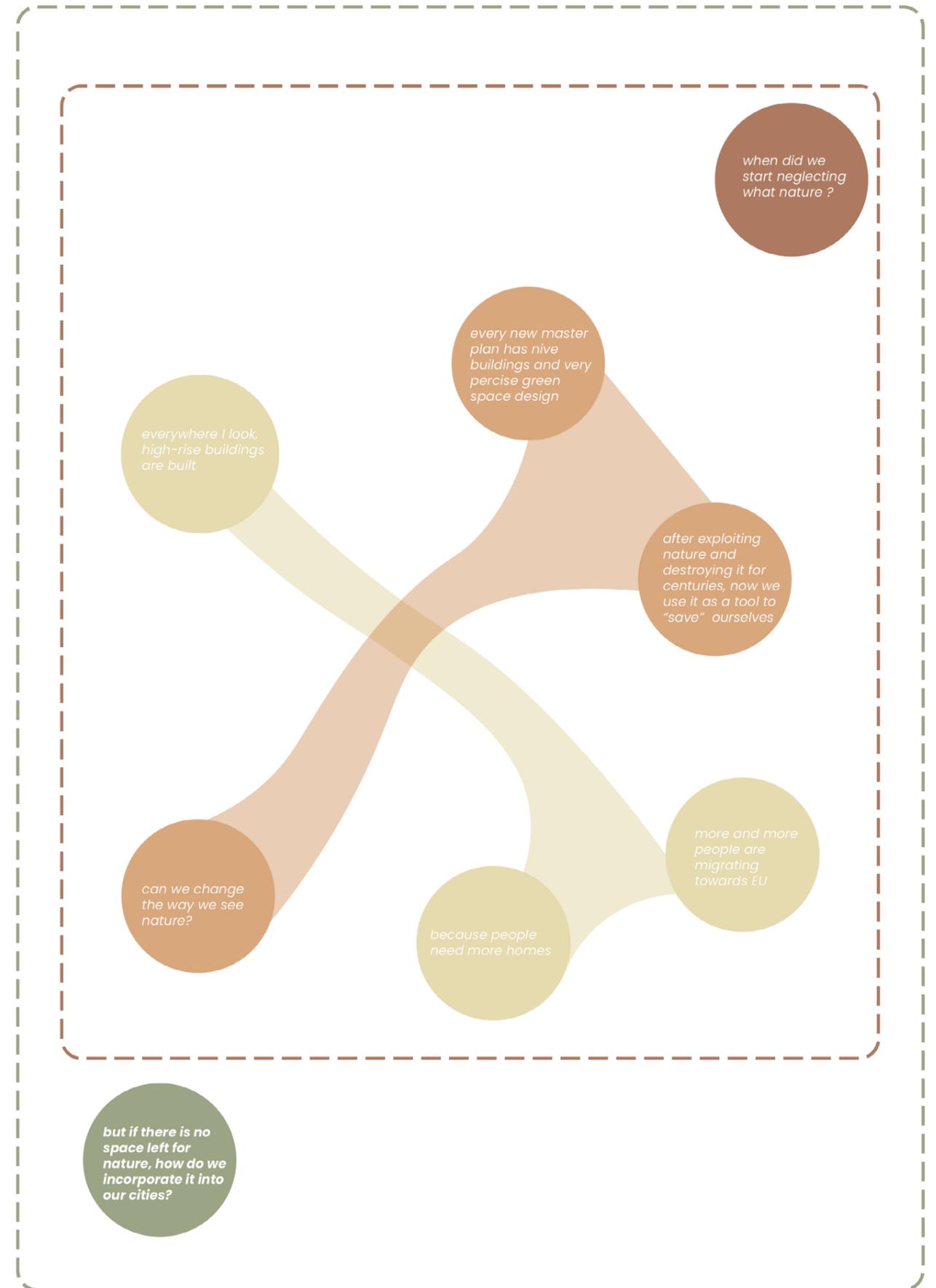


Figure 3: Mind map
Source: Author

Chapter 2

Understanding the crises

In this chapter, the emerging crises of the world will be briefly analysed and presented, as well as how they are linked to the global degradation of the natural environments both in and out of the urban fabric. After providing the routes, the problem statement will be presented in the context of the Dutch city of Zwolle, highlighting the importance to design hand in hand with nature.

2.1 The crises

2.1.1 Climate crisis

The climate change is a problem that affects the entire world and is right now one of the most emerging crisis that needs to be tackled. Since the 1800's, human activities such as the burning of fossil fuels and deforestation, have been the main factors that contribute to the shifts in the climate. By burning fossil fuels, greenhouse gas emissions are being generated and released into the atmosphere, causing a number of consequences such as the greenhouse effect, which leads to the rise of the Earth's temperature. This chain of reaction that the climate change causes affects not only our natural environment but also our built environment and people. Due to fluctuations in temperature, the increased droughts, the sea level rise food, health and shelter are at risk (UN, n.d.).

Poverty and displacement of people all across the world are more evident in the last decades. Floods, storms and tsunamis can destroy homes, water scarcity can affect crops and heat can make it hard for people to even leave their homes for their daily needs. Over 23.1 million people have been displaced on average since 2010 until today according to the UN, and most refugees originate from countries that are vulnerable and unable to adjust to the impacts of climate change (UN, n.d.).

In the European context, and specifically in the Netherlands, the link between climate change, population growth and the housing crisis can be seen across the country but not always in the same shape and form. The Netherlands as it is a country situated below sea level, has a high risk of flooding due to sea level rise heavier rainfalls and in general, extreme weather events. To tackle climate change, according to the Dutch government it is crucial to reduce the country's greenhouse gas emissions by 49% by 2030, compared to 1990 levels, and a 95% reduction by 2050 (Ministerie van Economische Zaken, 2020). These goals were set in the Climate Act on May 28, 2019. At the same time, while combating to reduce the greenhouse emissions, the Dutch government needs to meet the future demand of housing and create approximately 900,000 new homes by 2030 (NL Times, 2023).

The Dutch climate is becoming more severe and it can be noticed through several examples like the extreme draughts in 2018 and 2019 as well as the flooding that occurred in the summer of 2021, that was caused by torrential rain (Kennisportaal Klimaatadaptatie, n.d.).

The increase in the temperature in the Netherlands means that warmer days will start occurring earlier through the year, and already people have start noticing what climate change actually is. Although Dutch weather is also known for its long periods of rain, the probability of longer periods of draught is rising, as higher temperatures mean more water evaporating. But when the evaporation is more frequent than the precipitation, draught may occur. But at the same time, the flooding probability is also growing. The Netherlands is prone to flooding not only due to heavy precipitation and thus higher river discharge volumes, but also because of the sea level rise.

As shown in the maps, it is noticeable that the highest probability of flooding in the Netherlands will occur along the coastline and along riverine areas like the Rhine, the Meuse, and the IJssel. Even in the smallest probability, these areas may be flooded, leading primarily to loss of land.

The combination of these crisis and also the way of resolving/ tackling these crisis has a large impact on the current and future urban fabric. Cities and even countries may have to undergo major changes and it is possible that the future city will not resemble the cities of today. Built and natural environment have to change in order for humanity to have a better quality of life.



Figure 4: People watch a wildfire in the town of Rafina, near Athens © AFP
Source: Kakisis & Chappell, 2018

2.1.2 Population growth

One of the major emerging problems that the world needs to address and acknowledge is the global population growth. The number of people is steadily on the rise, regardless the fact that the rate of growth has been slowing down. The current world population is around 8.1 billion according to the most recent estimations of the United Nations, and is three times larger than it was in the mid-twentieth century. In 1950, world's population was around 2.5 billion, and it took 37 years for this number to double, and reach more than 5 billion inhabitants in 1987. Therefore, recent predictions of the United Nations show that by 2059 the global population will reach 10 billion. Regarding 2100, the number of the global population can not be predicted with certainty, as the growth or degrowth of the number is linked not only to the mortality rates, but also to the high-fertility countries that are currently entering their demographic transition era. But, an early estimation states that the size of the global population is projected to reach between 8.9 and 12.4 billion in 2100 (United Nations Department of Economic and Social Affairs, Population Division, 2022).

According to the European Environment Agency: "Urbanization is the increase in the proportion of people living in towns and cities. Urbanisation occurs because people move from rural areas (countryside) to urban areas (towns and cities). This usually occurs when a country is still developing" (European Environment Agency, 2017). Despite the fact that this rapid growth of the urban share can occur due to various factors such as natural growth or migration, cities do not grow in the same form and at the same rate (Buhaug & Urdal, 2013). As the global population rises, the need for continuous rapid urbanization grows and we continue asking ourselves:

"where do we accommodate people?".

In the context of Europe, more and more cities are experiencing population growth, due to migration. Various factors such as economic, climate, education and work are contributing to the migration towards countries with better opportunities, like the Netherlands. The Netherlands portrays the same demographic patterns as most European countries regarding the aging population and the fertility rates. But, migration towards the Netherlands and internally in the country, is growing fast, which brings internal crisis like the housing crisis (CBS, 2021).

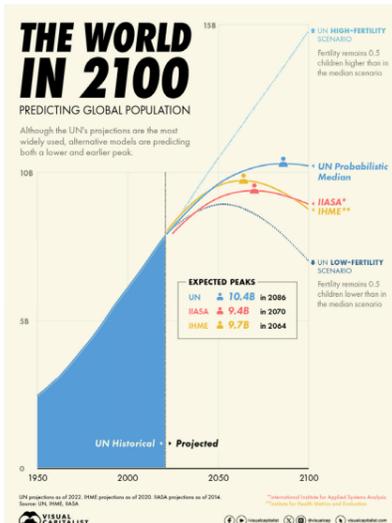


Figure 6: Prediction of population growth diagram
Source: Capitalist, 2024

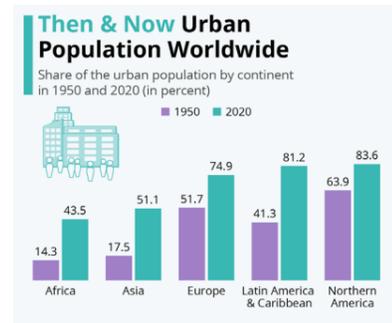


Figure 5: Population growth diagram

Source: Buchholz & Richter, 2020

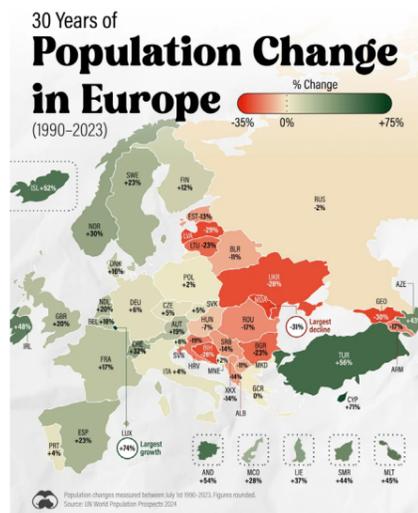
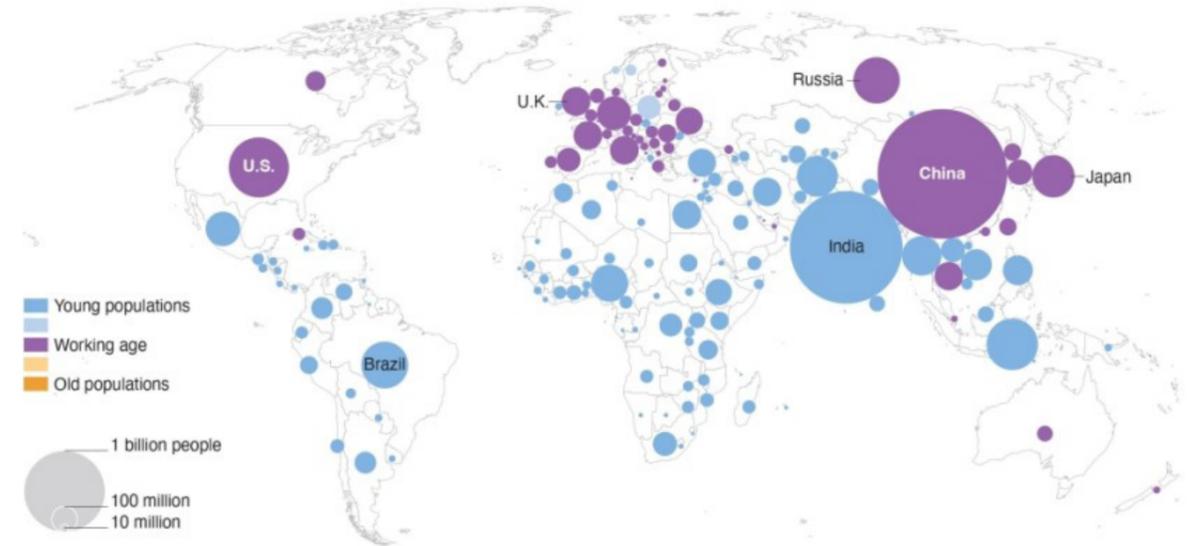


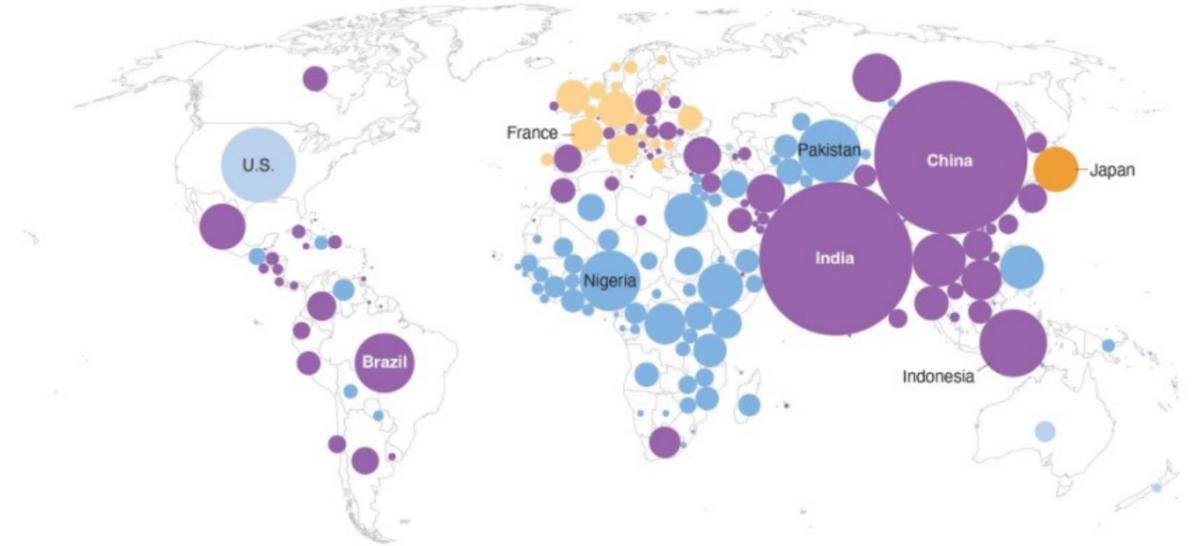
Figure 7: Population change in Europe of 30 years
Source: Capitalist, 2024

As Rich Countries Age, Developing World Will See Opportunity

1990 The world's dominant powers had large working-age populations in the 1990s. Others were still very young.



2023 Today, much of Europe is aging, and Japan is particularly old.



2050 In 2050, most of today's richest countries will be old. Others will have huge working-age populations for the first time.

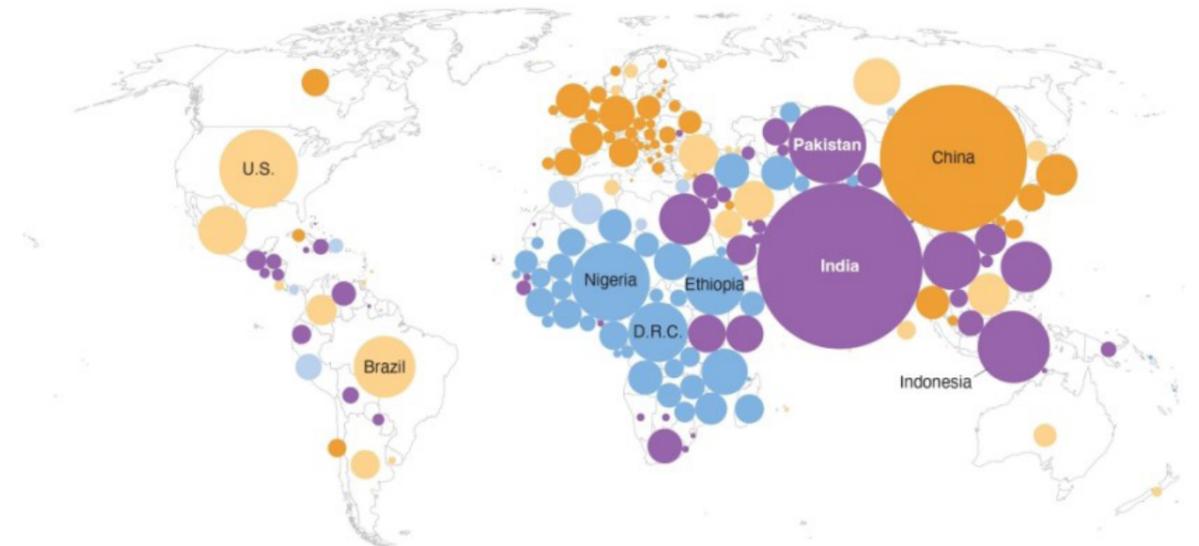


Figure 8: Population change in Europe of 30 years

Source: AFP, 2024

2.1.3 Housing crisis

Since 2008, one of the biggest problems in the Netherlands is the housing shortage. Although, the recession of the housing market started in 2008, the housing production remained at a reasonable level. On an annual basis in the period 2000-2008 around 79,000 homes were built on an average. From 2013 and onwards, the supply of housing declined rapidly, and in combination with immigration, by 2018 the housing shortage increased by 3.2% (Boelhouwer, 2019).

Today, the Netherlands is yet facing one of the biggest challenges regarding the housing shortage, which increases rapidly over the years. Even if immigration slows down, according to Housing Minister Hugo de Jonge, the Netherlands will have to build 1 million homes in ten years after 2030 to close the gap between supply and demand of housing (NL Times, 2023). The housing crisis is more evident in larger cities like the cities of the Randstad area, because most of the people chose to immigrate towards bigger cities for more opportunities (either job or education). De Jonge has shifted his focus towards the east of the country and states: "We can't all continue to live in a huddle in the Randstad" (NL Times, 2023).



Figure 9: Demonstration regarding housing crisis in the Netherlands

Source: Proctor, 2024

2.1.4 The human-centred world

The world has often been viewed as existing primarily to meet human needs, a perspective deeply rooted in history. From early human societies to modern industrialization, humans have utilized and exploited Earth's natural resources for survival and development. Over centuries, human actions have led to significant environmental degradation, including water pollution, deforestation, and air pollution. These issues are largely driven by the anthropocentric point of view, which places humans at the centre of moral and ethical consideration.

Anthropocentrism, as defined in philosophical and environmental literature, views humans as the most important entity in existence, often subordinating nature to human interests (Boslaugh, 2016). This belief of superiority of the human kind has led to the destruction of the natural environment, creating a dichotomy between people and nature.

The consequences of this anthropocentric approach are evident in today's global environmental crises more than ever before. Deforestation, for instance, has been accelerated by agriculture and urban development, driven by the belief that land is primarily valuable when it serves human

economic interests. Similarly, air and water pollution from industrial activities are often justified by the prioritization of human progress over environmental preservation, leading to long-term ecological and health consequences of all human and non-human species.

Recent scientific discussions call for a shift away from anthropocentrism toward ecocentrism or biocentrism, which advocate for the intrinsic value of all living organisms, not just humans. This shift is necessary as the exploitation of the Earth has reached its peak, and more and more of the natural resources are becoming scarce. Such a shift would put as a priority to promote sustainable practices that prioritize the health of ecosystems alongside human needs, fostering a more balanced relationship between people and nature.

When nature is being treated as a mean to fulfil the human needs, the connection between people and nature is lost. In order to re-establish this human-nature connection, it is important to re-establish biophilic design principles into urban planning and design to create greener cities with natural elements in their urban fabric.

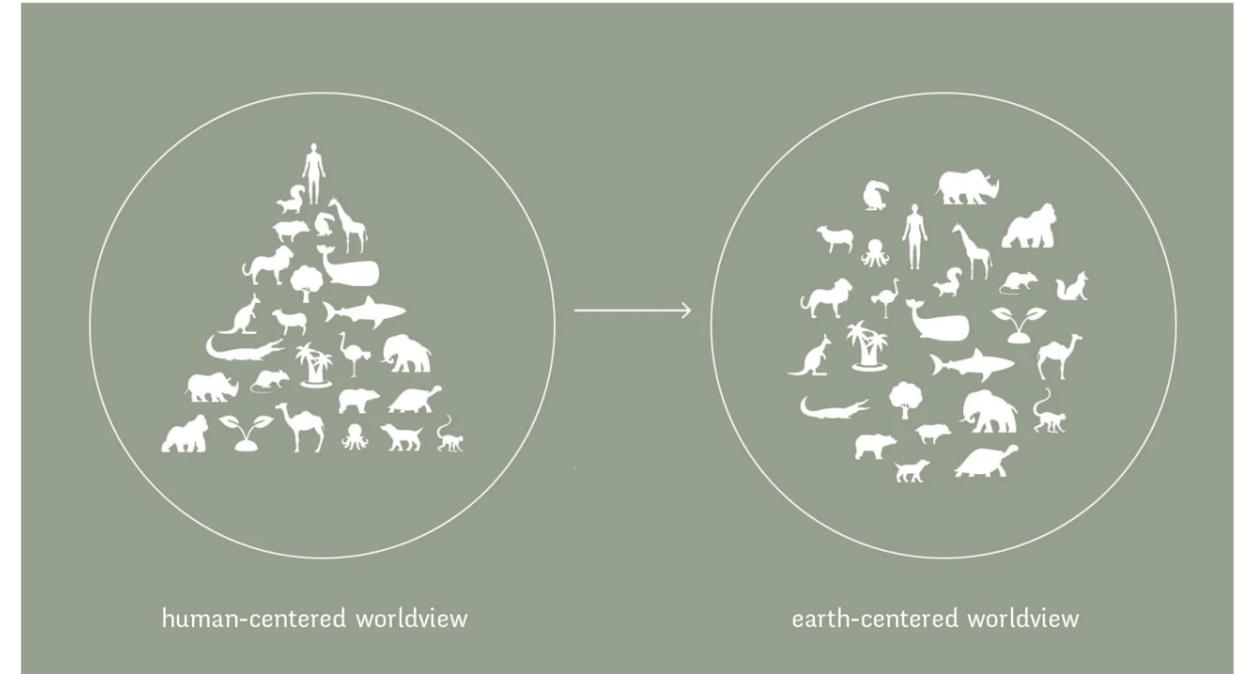


Figure 10: Earth is a communion of subjects

Source: Xinatti, 2021

2.1.5 Spot the nature

Nature in the urban fabric can take many shapes and forms: from a square meter of grass or a tree to a park, green façade or even ecological corridors. Most people in their everyday life are unable to recognise and name the type of flora or fauna they come across, because humanity has been disconnected from nature a long time ago. Although people are drawn naturally to nature and green, as they associated it with “a weekend gateway”, or “a place to relax”, or “where kids can play”, they chose to get out of the city and search for this nature, but don’t advocate for incorporating it inside the city.

In 1979 E.O. Wilson developed the biophilia hypothesis in which he suggests that humans have a natural/inherited connection towards nature. This theory was developed based on the evolutionary history of people, according to which people have the need and seek connections with other forms of life and natural environments (Wilson, 1984). If looking closer at the etymology of the word, in Greek, biophilia is a word created by two words “bios” which means life and “philia” which means friendship. So, etymologically it is translated into friendship/love for life.

The biophilia hypothesis has since been incorporated into various fields, including psychology, architecture, and urban planning, as it underscores the importance of incorporating nature into human environments for improved well-being. In spite of the extent of how people perceive biophilia, research has indicated that even by simply spending time in/ around nature can be beneficial for human health (physically and mentally).

But in what form can we spot nature in our cities nowadays? The most common answer to this question would be parks, or simply trees, grass and flowers. In the last decades, more and more cities try to integrate natural systems, so that nature can return back to the urban fabric, enhancing not only the area in an ecological but also in a socioeconomic way (Thomson et al.,

2016).

In the context of the Netherlands, most cities have made nature part of their evolution, not only for ecological purposes but also for climate mitigation benefits. Sponge parks, green-blue structures, flooding gardens, green-blue rooftops, forests and ecological corridors are only some of the examples of types of nature one can find in the Dutch landscape. Nevertheless, most types of nature that can be spotted in cities may feel from time to time too “designed” and less “natural” and “adventurous”. For example, the experience of using a park that is well-maintained from using a forest to explore is completely different, and that is why people continue to seek “nature” outside the cities. The feeling of excitement, adventure and exploration are main drivers for seeking out new types of natural environments, in which people can not only engage in physical activity but also find a moment of serenity and piece.

In today’s practise, nature and greenery is being treated as an extra addition to a developed masterplan/spatial strategy, or even as a compulsory box the stakeholders have to “check” in order to align with the government’s or the EU’s goals regarding the climate.

Most of the times, urban developments prioritise building houses, roads and all necessary utilities to accommodate people’s needs, and neglect the existence of greener public spaces. As an addition, often pocket parks or greenery that is developed afterwards, become isolated green patches, that although serve the needs of the residents with a close proximity to them, but do not provide any environmental benefits, like the support of biodiversity.

Many Dutch cities, that are growing rapidly are facing the dilemma of

expansion. If a city decides to expand, it means that land that was previously occupied for agriculture or recreational purposes, needs to be given for houses (as the housing crisis is dominant nowadays in the Netherlands). So, many Dutch cities, at least for now, are trying to find solutions in densifying and accommodating more people in the current cities’ boundaries. But this path leads to an other dilemma: how much space is going to be dedicated to buildings and how much space can we leave for nature ?

Cities on the Eastern part of the country that are expected to grow in the next years, like Zwolle, Deventer, Arnhem and Enschede, driven by an increase in the housing demand, as well as population shifts from the West of the country towards the East, need to shift the paradigm of how stakeholders and citizens see greenery in the city, making decision that will benefit the city climate – health –environmental – social wise in the future.



Figure 11 Photo of urban greenery

Source: Author

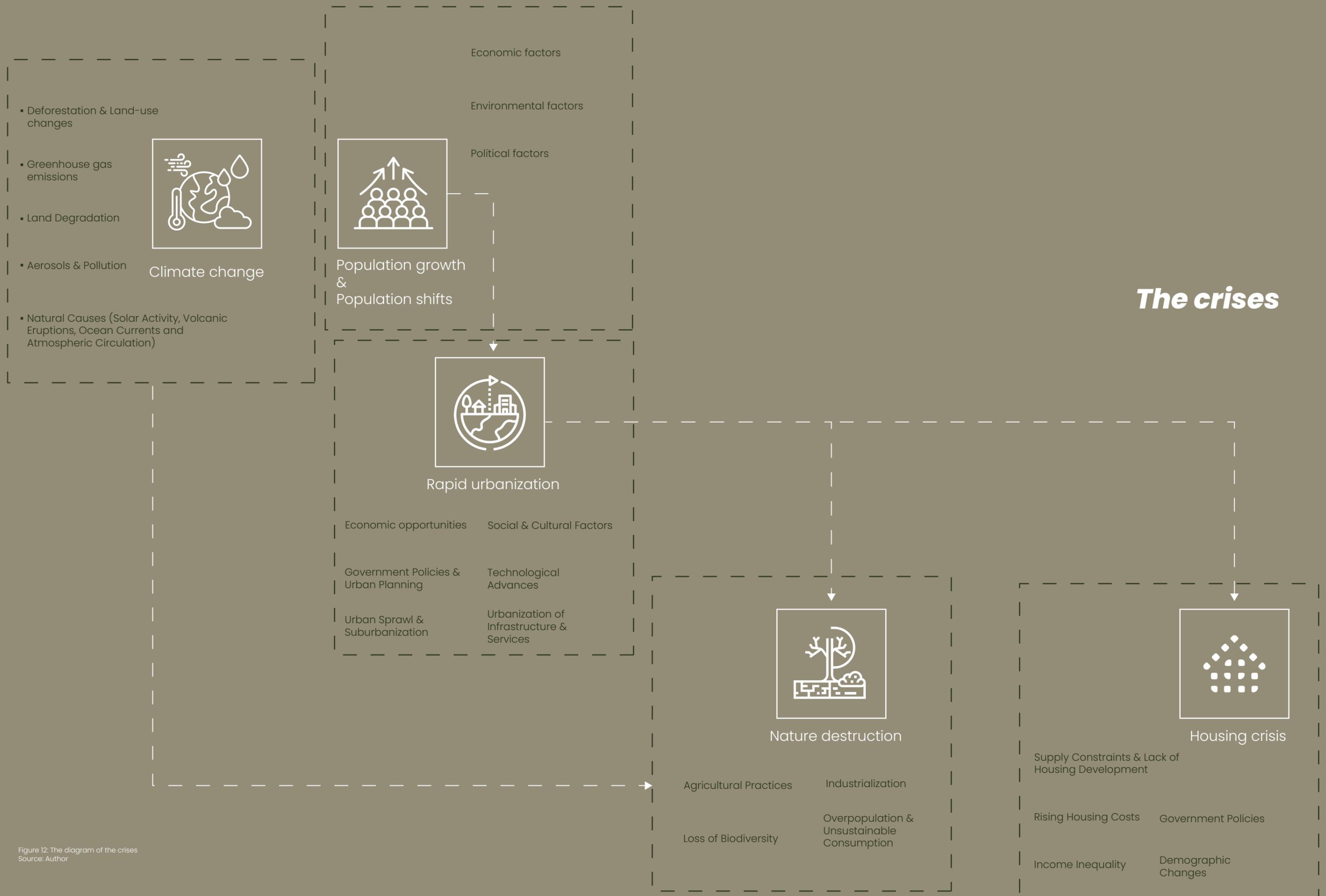


Figure 12: The diagram of the crises
Source: Author

Chapter 3

Context

In this chapter the context of this project is presented. The city of Zwolle in the Netherlands was chosen, as it is a city prompted to grow in the next decades, while facing the effects of climate change.

3.1 Zwolle as the case study

3.1.1 History of Zwolle

Zwolle is the capital of the province of Overijssel and is located in the Northeastern Netherlands. The city of Zwolle borders the province of Gelderland and is East of the river IJssel. The area has been inhabited for centuries, according to archaeological findings, and the origin of the city dates back to the year 800. The first inhabitants of the area established their settlement on a sandbank along a small river, as it was the highest point in the area, surrounded by often swamped landscapes. This chosen location of the settlement would play a pivotal role for the development of the city: a hub of trading and a market centre (Hove, 2005).

As of significant importance and status, Zwolle receives city rights in 1230, giving the city the ability to fortify itself with moats and city walls, that would become the first line of defence to emerging threats. In the fire that occurred in 1324, which was caused on purpose by the robber knight Zweder van Voorst the city was completely burned to the ground. Immediately afterwards, Zwolle was rebuilt towards the west, and up to this day the distinction between the earlier-fire uneven street pattern in the eastern portion of the city centre and the later-fire considerably more regular street design is still evident on maps (Kam, 2020).

After Zwolle was founded and obtained city rights, in order to protect itself, city walls and moats were built. The old city gates and fortifications, such as the 'Sassenpoort' erected in 1409. The city joined the Hanseatic League in 1448, enabling trade and economic development with cities all over Europe (Hove,2005). In order to secure the city during the Eighty Years' War, a distinctive peninsula was produced by the star-shaped inner city's layout and the incorporation of the moat within these walls. This peninsula proved perfect for trade and industry and ultimately influenced the growth of the city (Canon van Nederland, n.d.).

During the 19th century, it had become clear that the defence systems of Zwolle were not needed anymore and were creating a border towards further expansion of the city. The city's fortification started slowly to be demolished or re-purposed into housing or green areas (Hove,2005). After the creation of the railway station, the city's population grew rapidly, and social housing neighbourhoods like Assendorp, were created in order to accommodate more people (Hove,2005).

After the creation of the railway station the city expanded even more towards the water, as it is shown in the map. During the World War II, the road bridge and the railway bridge over the IJssel were blown up. Zwolle became the place where the "Jewish Council" was founded by the Germans (Hove,2005).

Towards the end of the World War II, Zwolle started gradually to re-construct and expand further more. Constant development and improvement with respect to its history is Zwolle's characteristic. After the fortification was demolished the city of Zwolle underwent significant changes. Constantly evolving, Zwolle became a vibrant student city boasting a population of 130 thousand as of January 31, 2022, ranking as the nineteenth largest city in the Netherlands. The high demand of housing has also created on one hand more home expanding towards the outskirts of the city, but on the other hand, nature was gradually encroached. It is noticeable that in the area of the historic city centre there is almost no green left, whilst the area is undergoing constant redevelopments.

But what will the city of Zwolle look like in the future? Is it possible that the image of the city as we know it will not exist in a hundred of years because it will not serve people's needs anymore?

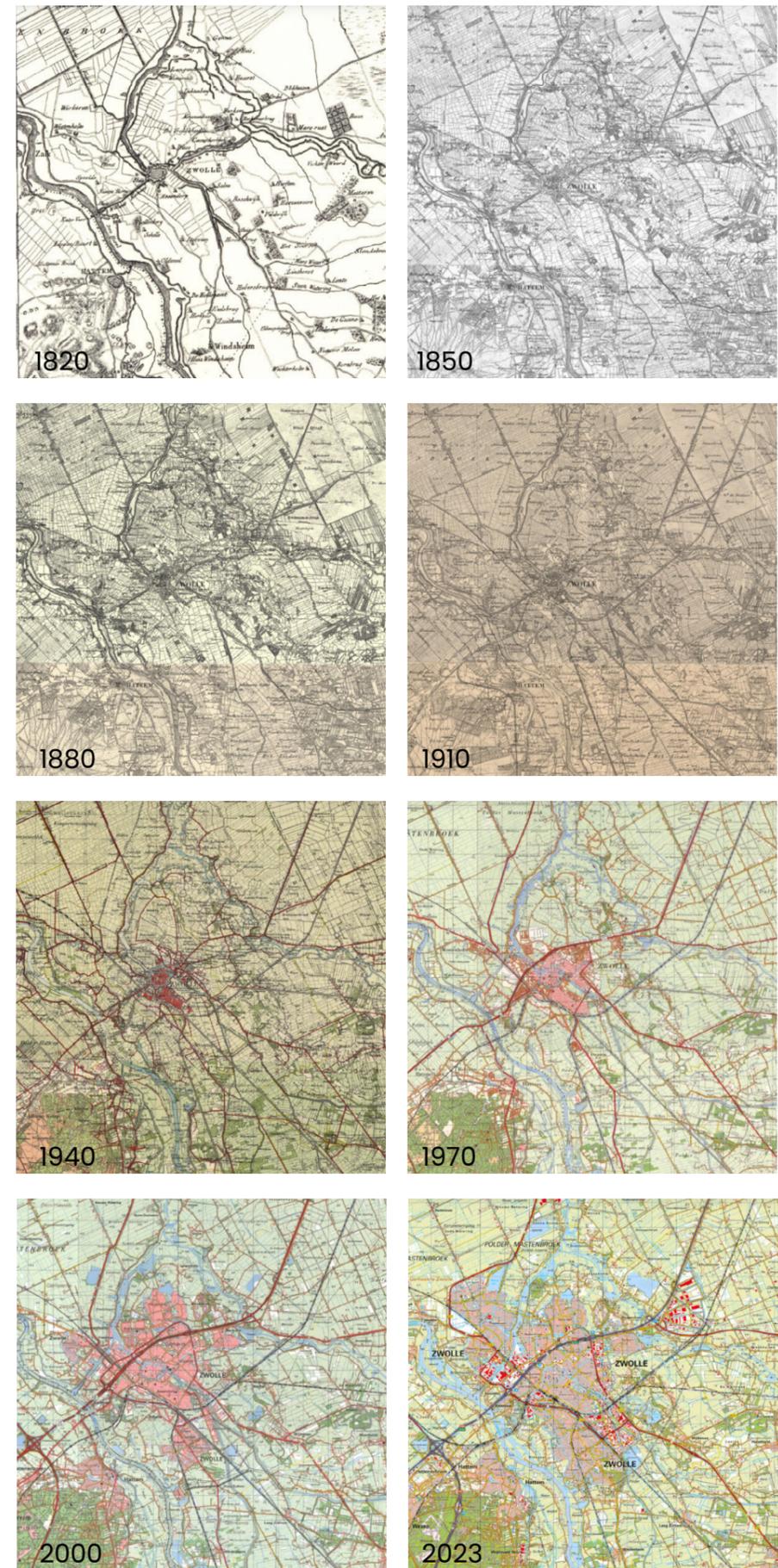
When looking the urbanization process of Zwolle under a different lens, one can also see the shrinkage of nature that took place in order for the city to exist as it is today. Nowadays, the current landscape around the city boundary is primarily the IJssel river on the West side of the city, the Natura 2000 protected site on the North side of the city and the rest of the city is surrounded by farmlands.

Regarding the natural elements in the urban fabric of Zwolle, although on a first glance the city may seem green enough, most of the city's green can be summarized into two categories: trees and grass. There are a few parks that have recreational value and/or ecological value and are not equally distributed across the city. On the peri-urban fabric of Zwolle, some places are spotted that may potentially prosper as places of natural habitat, like swamps and the river banks. The element of the water is also evident inside the urban fabric, mostly in the form of canals.

In the last decade, more and more "empty spaces" have been reserved for the expansion of the urban fabric, especially towards the Northwestern part of the city.

Figure 13-20: Urbanisation of Zwolle over the decades

Source: Topotijdreis,2024



3.1.2 Status quo

The Netherlands has currently a shortage of 390,000 homes and in order to close the gap of housing supply-demand, around 900,000 have to be built by 2030, according to Housing Minister Hugo de Jonge (NL Times, 2023). Most people when immigrating towards the Netherlands, or relocating within the country, chose to live in the Randstad, due to the opportunities regarding work, education and lifestyle. But how much longer will the Randstad be able to accommodate this rapid population growth? Already, there is a shift happening and more and more people chose to relocate towards the East of the Netherlands, and according to current trends, it is predicted that the East will grow rapidly in the next decades and the shift in the functionality of the current cities and municipalities will be drastic.

Like the entire country, every city in the Netherlands is re-thinking the way to mitigate both climate change crisis and the population growth crisis that has resulted in rapid urbanization and housing shortage. Zwolle is no exception to the rule: the city has been conducting research regarding not only the protection of the city against possible flooding scenarios, but also scenarios of expansion and densification.

The municipality of Zwolle aims to develop at least 50% of their demand in housing within the existing city boundary, while taking into account that there is still a gap of the housing shortage to close, especially in more suburban areas. This may seem as a paradox, especially when taking into account that the municipality of Zwolle owns around 700ha of land plots, that are situated outside the existing city boundary (Shahab et al., 2020). Already projects for the areas of De Tippe and the Het Buyten project in Wythmen have received founding to move further with construction of housing (Municipality of Zwolle, 2023). Furthermore, strategies have been developed also for the areas of Assendorp and

Kamperpoort in Zwolle in order to explore the opportunities to built more houses and redevelop the areas (Municipality of Zwolle, 2023).

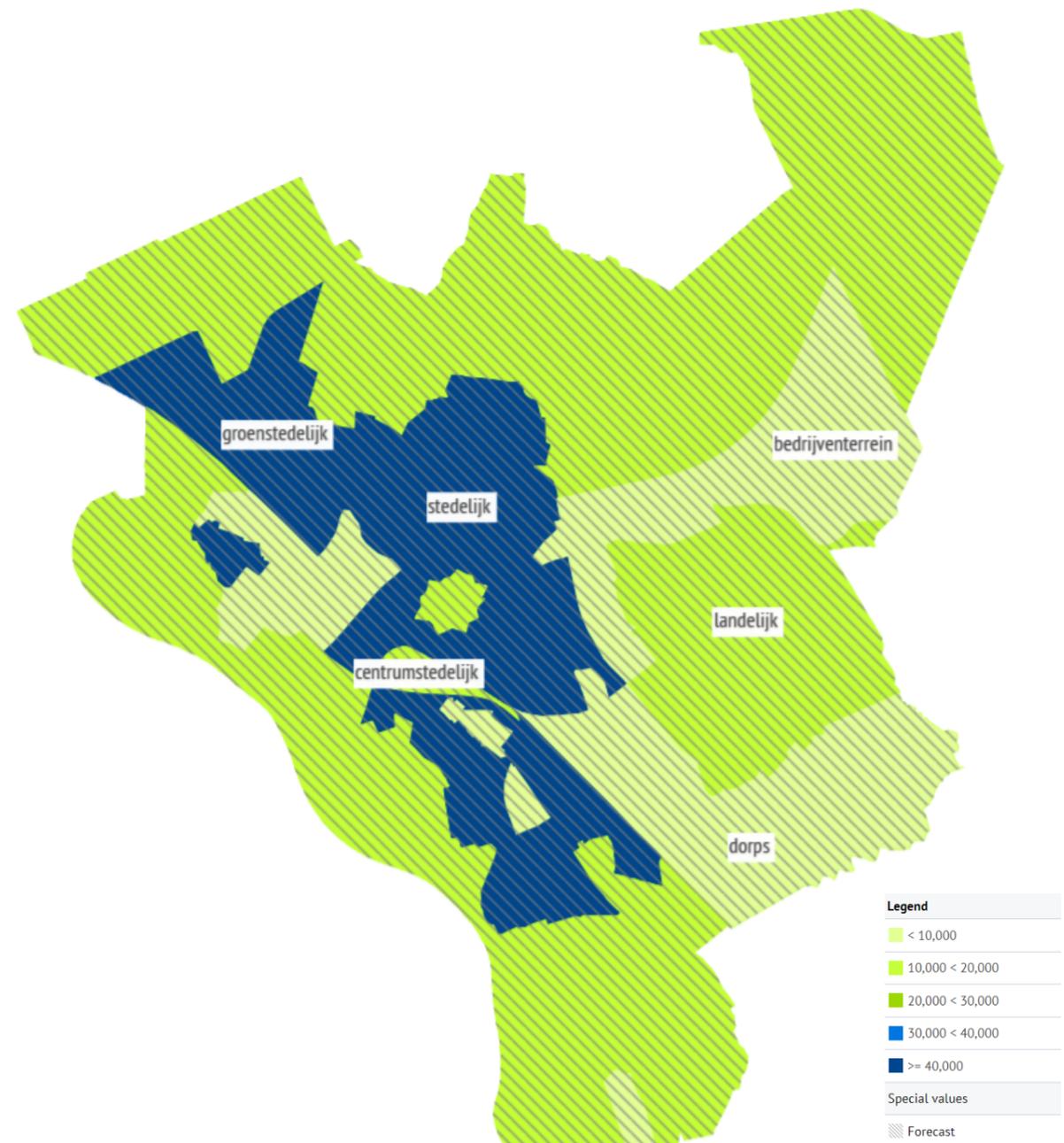
The Zwolle region is also part of the Urban Network Netherlands, which is the center of the country's economy. Therefore, the Zwolle region is prompt to significant growth challenges to accommodate new inhabitants. In order to achieve that the region has to built at least 50,000 homes by 2040. But it is important that this pressure of building new accommodation does not interfere with the climate-adaptive and economic growth goals of the city. It is important that the quality of the living environment and its accessibility is maintained in the best interests of its residents (Ministry of the Interior and Kingdom Relations, n.d.).

Regarding the climate-adaptive strategies, the municipality of Zwolle is aware that the city's current adaptive delta system is reaching its limits, and needs to come up with new strategies that will allow the city to restore the balance between soil systems and water, in order to make the city robust and resilient for the future (Ministry of the Interior and Kingdom Relations, n.d.).

It is important for any strategy that is being developed either for mitigating the housing crisis or the climate crisis, that the strategy and design include greenery. And in order for it to have specifically climate mitigation aspects, this greenery needs to be implemented throughout all the scales, from the entire region to the streetscape, and building (Ministry of the Interior and Kingdom Relations, n.d.).

Figure 21: Population growth forecast of Zwolle by 2040

Source: <https://cijfersoverzwolle.nl/>



3.2 Problem statement

A steadily growing population and an urgent need for urban expansion are the main drivers of the dual crisis the Netherlands is currently facing: the housing crisis and the climate change crisis. Due to constant external and internal migration flows, the government needs to take action in tackling the problems regarding the housing shortage, with the aim to create an environment that is also climate resilient.

Zwolle, like many Dutch cities, finds itself grappling with this dual challenge. The need to accommodate a growing population while bolstering the city against future climate change impacts is paramount. However, this pressing need for development often overlooks a very important factor: the natural environment. The majority of stakeholders involved in the decision making when it comes to changes in the urban fabric, prioritize building over integrating nature, leading to little and fragmented green urban spaces throughout the city.

As Dutch cities continue to grow, the majority of stakeholders involved in the decision making when it comes to changes in the urban fabric, prioritize building over integrating nature, leading to little and fragmented green urban spaces throughout the city.

It is of great importance to create strategies to manage these major crises not only to maintain the ecosystem but also to protect and accommodate the needs of the people, especially in the public space. A paradigm shift is necessary – one that moves beyond simply “building more” to embrace a holistic approach where nature is not an afterthought, carefully added in pieces in the future, but a fundamental design principle.

A strategic plan needs to be created that prioritises the nature-orientated design of the urban fabric, one that recognises the importance of having more green public spaces and trees, and one that is easily understandable, applicable and transferable. This plan must address the historical imbalance, and reassure that the creation of a climate-resilient future environment goes hand in hand with the restoration and celebration of Zwolle’s natural heritage.

Chapter 4

Research structure

The purpose of this chapter is to provide an overview of the research structure, research aim and methodological framework of this thesis. It is important to understand the urgency of including and prioritising nature when designing the urban fabric, and simultaneously understanding the relationship between nature – built environment – people. To come up with a strategy based on this relationship, research and design come hand in hand and work as one.

4.1 Research aim

The research aim of this graduation project is to explore the possibilities of designing and creating more places of green in the public space of Zwolle. As addressed in the previous chapters, the existing challenges regarding climate, population growth and housing are pressuring the cities to start planning and designing to tackle these challenges by 2100. It is important to realise on an early stage how the exploration and use of natural elements and greenery can contribute to better living conditions in the urban environment, and at the same time, create a healthier environment for human and non-human species. Through this project, the goal is to understand better how nature fits into the city, in simple principles, while addressing the necessity of nature in our everyday lives.

This graduation project aims to expand and create new green spaces throughout Zwolle, with the development of a strategy that consists of several design principles and design applications that are based on the use of the 3-30-300 rule of Dr. Cecil Konijnendijk, director of the Nature Based Solutions Institute and honorary professor of urban forestry with the University of British Columbia. This tool has been created for stakeholders and citizens to better understand the importance of trees and greenery at a certain proximity in a city, and at the same time provide 3 simple guidelines of how to make a city greener. But how does one actually use this tool as a designer?

Understanding the tool and using it in a city specific context, whilst underpinning the importance of creating vibrant and greener spaces throughout the city has led to the development of the main research question of this project:

“What if the biophilic design strategy of Dr. Cecil Konijnendijk would be implemented in the streetscape of Zwolle to improve the existing public space by 2100?”.

4.2 Research question

As presented in the previous sub-chapter the main research question of this graduation project is:

“What if the biophilic design strategy of Dr. Cecil Konijnendijk would be implemented in the streetscape of Zwolle to improve the existing public space by 2100?”.

To be able to answer the main research question, a series of four sub-research questions have to be formed and structured, in order to be able to explore, analyse, design and implement ideas. The project will also follow the structure of the sub-research questions as follows:

Exploration

1. What is the current approach of introducing nature into the urban fabric?

Through the first sub-research question, it is important to dive into main theoretical approaches that have been developed, researching the importance of nature in our everyday lives, and the positive effects trees and green spaces have for human and non-human wellbeing. At the same time, main concepts of designing with nature will be introduced, and tools will be explored in order to test further in the process how these tools actually work when designing for a context-specific place.

Analysis

2. What is the status quo of Zwolle's green spaces and their impact on the citizen's life?

With the second sub-research question it is important to analyse and understand Zwolle's context, in different layers and especially focusing on the green/nature layer. Examining how effective the current situation of the green spaces and greenery in the city is, gives an overview of possibilities and limitations regarding the next phase of the project which is the design.

Research by Design

3. How can the “3-30-300 rule” be applied to Zwolle's context in order to integrate more nature in the city's urban fabric?

Exploring different design options through the research and design methodology will provide different options and configurations that can be tested and applied throughout the scales, in order to come up with a variety of interventions. The options on every scale will also create the necessary strategies to be applied throughout the entire city.

Evaluation

4. How can the options developed with the use of the 3-30-300 rule be evaluated ?

Present the possibilities and opportunities that have been developed throughout the research by design phase and highlight the positive and negative effect of the interventions. Lastly, it is important to understand also all the difficulties and limitations of design strategies when discussing how to “make space for nature”.

4.3 Methodological framework

A combination of methodologies are going to be used in the project, in order to answer not only the main research question but also every sub-research question.

Literature Review

Reading through scientific papers and theoretical design approaches in order to understand the underlying theories of biophilia, density, climate adaptation, resilience, healthy city and perception of space.

Document & Policy Review

Reading through different types of policy documents in order to understand what the current situation regarding strategies and plans are for my case study, but also to explore whether or not future policies, goals and strategies have been developed that can be used as a backbone for my strategy.

GIS Mapping

Through GIS mapping I will be conducting my initial analysis and exploration of different topics like green infrastructure and areas with potential of development. As I am working on a city scale, GIS mapping is an important tool to providing me all necessary data and visualizations of the city of Zwolle.

Field Work

Visiting the city of Zwolle is important to understand the urban tissue as a inhabitant of the area, walk through the city to locate problems/opportunities and understand better the scale of the project.

Phase	Research question	Method	Expected outcomes
Exploration	1. What is the current approach of introducing nature into the urban fabric?	<ul style="list-style-type: none"> Literature Review Document & Policy Review 	Understand the context, the opportunities & limitations
Analysis	2. What is the status quo of Zwolle's green spaces and their impact on the citizen's life?	<ul style="list-style-type: none"> Literature Review Document & Policy Review GIS Mapping Field work 	Understand the context, the opportunities & limitations
Research by Design	3. How can the "3-30-300 rule" be applied to Zwolle's context in order to integrate more nature in the city's urban fabric?	<ul style="list-style-type: none"> Literature Review Document & Policy Review GIS Mapping Field work Research by Design 	<ul style="list-style-type: none"> Diagramms to understand the physical application of 3-30-300 rule on a street scale Master plan on a neighbourhood scale Strategy map on a city scale
Evaluation	4. How can the options developed with the use of the 3-30-300 rule be evaluated ?	<ul style="list-style-type: none"> Literature Review Document & Policy Review GIS Mapping Field work Research by Design 	A list or criteria of evaluation of the options developed

Figure 22: Methodological framework
Source: Author

4.3 Methodological framework

Research by Design

One of the most important aspect of the development of my graduation project. In the analysis and experiment part, I will be using the Delft approach method to produce different variations of conceptual ideas, in a way that can help analyze, design and conduct preliminary conclusions. Through this method, a number of design possibilities can be produced and provide insight into what can actually be applied into a site specific area.

Figure 23: The Delft approach method
Source: Author

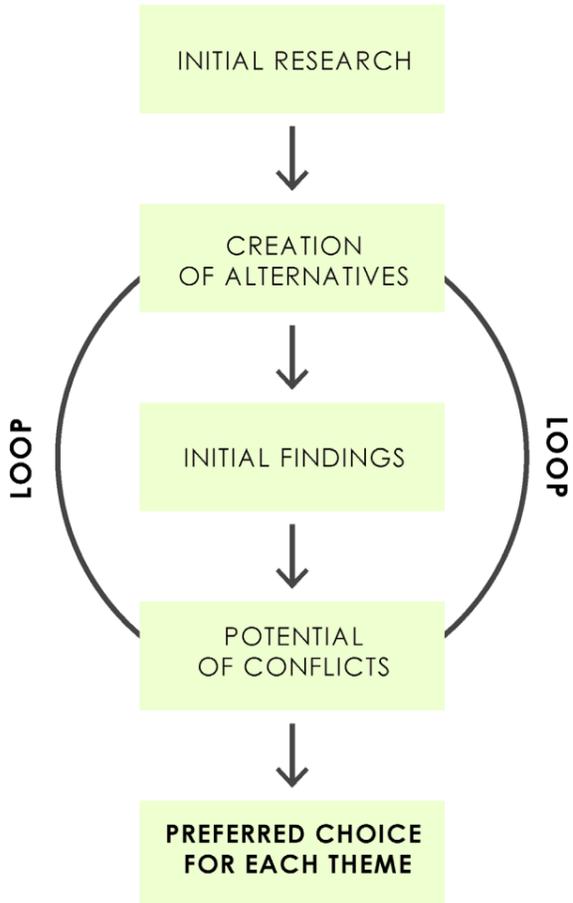
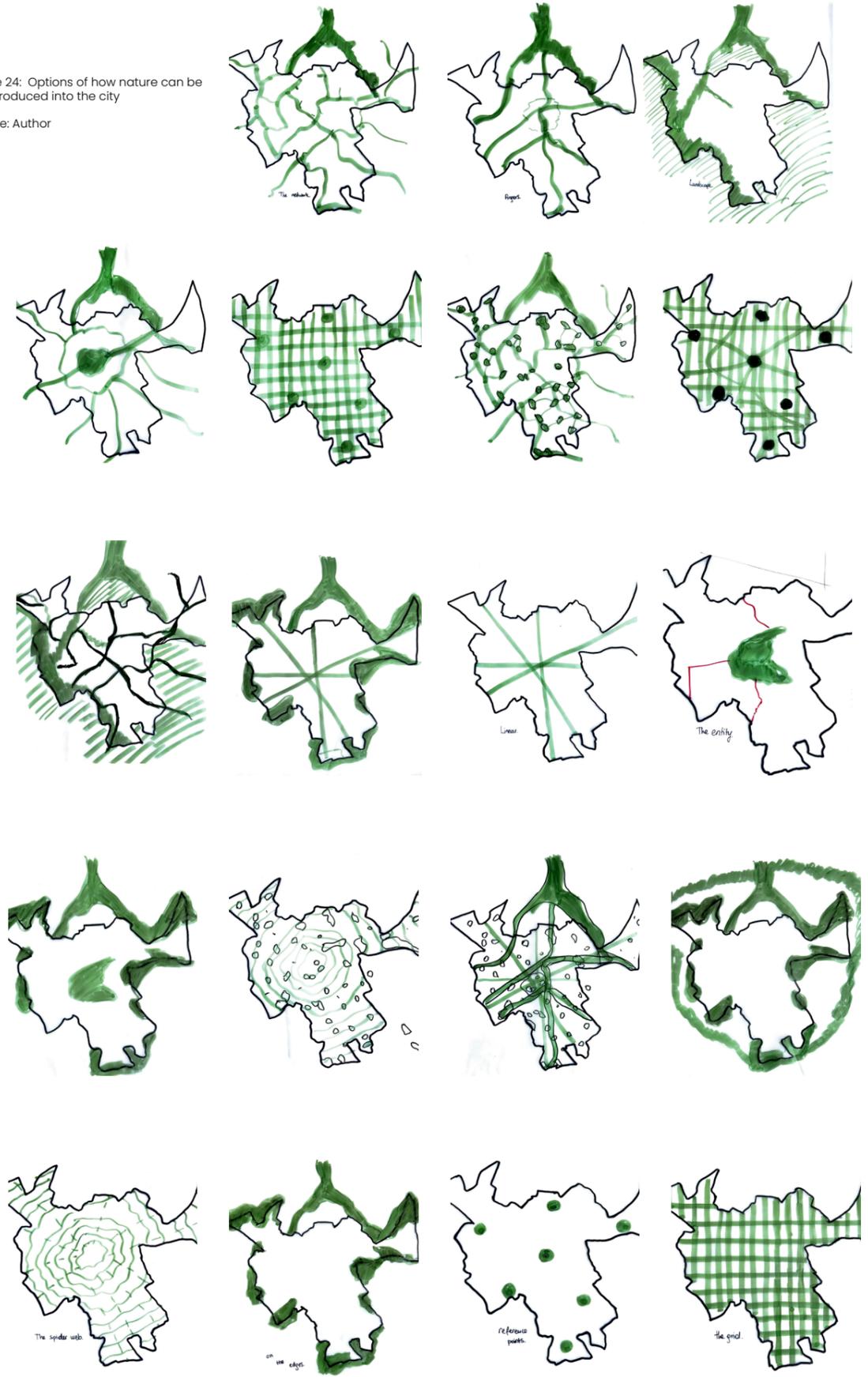


Figure 24: Options of how nature can be re-introduced into the city
Source: Author



4.4 Conceptual framework

The conceptual framework is presented in the form of a recipe. The key ingredients are listed on the next page as well as the way to achieve my vision for Zwolle by 2100.

The aim of this project is to explore how cities can become greener in a compact and smart way. Through the use of this recipe, it is made clear that there are dominant ingredients like the biophilic design aspect (the 3-30-300 rule), the urban greenery and the environmental resilience, which in this project has mainly been linked to the resilience and environment can achieve against climate change, but also at the same time, people's resilience (mental health resilience).

But because of the nature of this project, it is important that this process is clear and understandable by everybody: professionals, policy makers, people of the neighbourhood and even children. So the simplicity of the project is a key aspect of this report.

Lastly, after mixing and combining all the "ingredients", a design proposal will be developed for the neighbourhood of Kamperpoort. As mentioned in the introduction, Kamperpoort is a neighbourhood not only with a vulnerable environment but also with a vulnerable community.

It is important to understand that, this recipe can be adjusted and multiplied based on the needs of each environment and every community.

Recipe for a Biophilic City by 2100

List of ingredients

- 2-3 cups of the 3-30-300 rule by Cecil Konijnendijk
- 2 cups of urban greenery
- 2¹/₅ table spoons of biodiversity
- 5 cups of environmental resilience
- 1 pack of sustainable urban planning
- 0,5 gallon of community involvement
- A sprinkle of government policy support

For the "green" glaze

- 1 table spoon of social well-being
- 1 cup of ecological balance
- 1 pinch of public happiness

Instructions

"Preheat" the vision of the biophilic city of Zwolle of 2100. It is a healthy, vibrant and liveable city with lots of greenery in the public space, where people can relax, enjoy and be happy.

Start by "mixing" together the main ingredients for the base: 3-30-300 rule components and make sure after mixing you distribute it equally in smaller portions:

- 3 visible trees from every home
- 30% tree canopy coverage in the neighbourhood
- 300m or less to public green spaces

After mixing and distributing well into the forms, add biodiversity (different species of plants and trees, insects and animals).

Add the community involvement, and explain in very simple words why it is important for the inhabitants to participate into maintaining the greenery on the streets.

Lastly, put some of the Government support and policy before baking with the sustainable urban planning: establish some recommendations that government and policy makers can follow and let it evolve, while monitoring and making adjustments while we move into the future.

After every portion is baked, add on top the social well-being, combined with the ecological balance and the public happiness.

Let it sit (for a couple of years) and enjoy the layered dish of greenery, social cohesion and happiness.

Chapter 5

Theoretical background

The main purpose of this chapter is to present the theoretical foundation of this project, that connects all the dots between the theories related to the nature and green in the city and how designers integrate nature into the urban fabric in practise. By analysing the interrelations between people, nature and climate change, this chapter underlines the urgency of integrating nature into our cities, while at the same time it highlights the gap between theory and practise, unveiling the necessity of translating theoretical approaches into practical tools.

5.1 Theoretical framework

The need to change the way we view nature as designers is vital in order to be able to create healthy and liveable cities. Green is not supposed to be added after a plan/strategy/design has finished and all buildings and transformations are in place: green public spaces should be the starting point of every project, and not an addition to it.

But to change this point of view and establish green as a vital part of every design, it is important to understand and transmit the knowledge behind the numerous benefits green and nature has to offer not only to people, but also the environment and the city itself. Many theories have been developed in order to present and stress the need of integrating more green into our lives, but essentially, in practice, the design of nature comes due to the need to comply to specific frameworks or regulation posed either by the Government or by the EU.

In this chapter, different theories will be present to address the importance of nature not only for the environment itself, but also for people, for the city and for society itself to be able to have a healthy and liveable environment.

5.1.1 Human–Nature relationship

The natural world has always been the starting point of everything: life, food, air and all of its elements come together and create environments were not only humans but also non-human species, co-exist in a harmonious way. The importance of nature has been studied and analyzed in various sectors like the economic, the environmental and social. But, in the last decades, more and more studies have been conducted regarding nature and its impact on human health and wellbeing.

One of the first people to talk about the linkage between human health and nature was Frederick Law Olmsted (1822–1903), often referred to as the father of American landscape architecture. Olmsted believed strongly of nature having restorative benefits for urban dwellers. His co-proposal, the Greensward plan, together with Calvert Vaux (1824 –1895), came to be a large green space, serving as the “city’s lungs”, came to be what we know as the Central Park in New York City. Having witnessed the unsanitary conditions in which people would live in New York City before the Civil War, in the 1840’s, and the rise of typhoid and typhus epidemics in Europe, his vision together with Calvert Vaux included proper sanitation, thoroughly designed sanitation facilities and well-circulating waterways, as well as well-drained land. Olmsted’s belief of how powerful nature is has set the groundwork numerous studies that linked the benefits of nature to human health and mental wellbeing, although his own ideas were not supported by empirical research at the time (Fisher, 2010).

One of the most well-known and acknowledged theories regarding the connection between people and nature is the Biophilia Hypothesis developed by E.O.Wilson in 1979, as mentioned briefly in the second chapter. The Biophilia Hypothesis states that humans have an innate tendency and love for nature and other forms of live (Rogers, K., 2024). This genetic based affiliation

between humans and nature can be the basis to explain why people feel serenity and calmness when spending time in nature, or why being surrounded by greenery promotes happiness. This hypothesis created the ground for further research to “prove” with scientific evidence that, indeed, nature and natural environments have a positive effect not only on the physical but also mental health of people. The Biophilia Hypothesis can be found in practice, through the implementation of biophilic design, where elements of the natural environment are used in the design of the urban fabric, in order to re-connect people with nature.

In 1995, Attention Restoration Theory (ART) by Stephen Kaplan was published, supporting that the mental fatigue and concentration problems can be improved by simply spending time or looking at nature (Kaplan, 1995). According to Kaplan S., in order for the natural environment to be able to provide restorative effects, it should have four properties:

1. Extent (the scope to feel immersed in the environment)
2. Being away (providing an escape from habitual activities)
3. Soft fascination (aspects of the environment that capture attention effortlessly)
4. Compatibility (individuals must want to be exposed to, and appreciate, the environment)

Although, this theoretical approach has been widely accepted as a concept in the literature, it is still unclear how much of empirical knowledge and evidence exists to support this theory (Garside R., 2024).

In the last decades, a number of

empirical studies have been conducted, though, to understand how nature and the visible green affect people’s mental and physical health. According to Woodward et al. (2023), through research, the benefits of trees and green spaces have been linked to the positive effect on physical and mental wellbeing, and overall social-wellbeing. In order to promote and maintain public health and wellbeing it is important that the right trees are planted in the right place throughout a city. The benefits of this act can be witnessed on many layers, as urban greening can help to reduce greenhouse gas emissions in urban environments and add a stepping-stone into tackling the effects of climate change. Although trees are valuable in the urban fabric, their benefits can be seen as they mature and grow older. Through their size and tree canopy coverage, they provide shade, better quality of air and are aesthetically appealing towards people, making them a long-term asset in which cities need to invest for their future (Woodward et al., 2023).

The World Health Organization (WHO), recognizes and underlines the importance of the urban green spaces and natural environments for human health. Although there is no official definition of the “urban green space”, according to WHO: “Urban green spaces may include places with ‘natural sur-faces’ or ‘natural settings’, but may also include specific types of urban greenery, such as street trees, and may also include ‘blue space’ which represents water elements ranging from ponds to coastal zones. Typical green spaces in urban areas are public parks; other definitions may also include pri-vate gardens, woodlands, children’s play areas, non-amenity areas (such as roadside verges), river-side footpaths, beaches, and so on. The definitions are nuanced and context-specific. For example, they can depend on particular environment-health pathways under consideration” (WHO

Regional Office for Europe, 2016).

Among numerous studies that have been conducted in the field of psychology, many have shown that spending time in a natural environment can have many benefits for the human body. Oh et al., (2017) in their article in the journal of Environmental Health and Preventive Medicine, present their findings regarding the health and well-being benefits of spending time in forests (Oh et al.,2017). Af-ter conducting a literature research, the results showed that indeed, the exposure to the forest has a positive impact not only on the psychological but also on the physical well-being of the participants, including improvement in anxiety and depression levels, reduction in inflammation levels, as well as decreased stress levels (Oh et al.,2017).

Living in today’s world, means trying to keep up with the fast-paced everyday lifestyle, which elevates our stress and anxiety levels, leaving no space for a break. But, after the COVID-19 pandemic every-thing changed: the world stopped for a while, while bounding everybody to their homes. Even when leaving the house, the distance one could travel was restricted. Many people restricted themselves to their street, or their neighborhood, trying to distance themselves from others. While before, the front of the house and the street was there to accommodate specific functions, now the paradigm has shifted and this shift unveiled what cities are lacking: proximity-based-green spaces of quality.

5.1.2 Healthy and liveable city

According to the World Health Organization, a healthy city is defined by a process and not the final outcome. In this sense, every city can become healthy, regardless of its current health status. A healthy city is one that continuously tries to improve its physical and social environments, and at the same time expand its social resources, to allow people not only to support each other but also develop their maximum potential (World Health Organization, n.d.).

Healthy cities are environments in which both people and planet can prosper, and they are committed to the process of becoming healthy and maintaining their health. A healthy city prioritizes not only people but also participation, prosperity, the planet, the place and peace.

The mechanisms that link the health of cities to the health of people are complex and multidimensional. Accessibility to green may occur beneficial for people's health through various paths, that may also have a synergetic effect (WHO Regional Office for Europe, 2016). According to Hartig et al. (2014) the benefits of nature and green for people can be observed through four main pillars: Nature improves air quality, enhances and promotes physical activity, reduces stress and promotes social cohesion (Hartig et al., 2014).

But nature is not the only important component for a healthy city. It is important that a healthy city promotes physical activity, such as walking, reduces reliance on cars and enhances community connectivity and accessibility to nature. Green spaces are important to also provide recreational purposes and mitigate as effective as possible the climate change effects. It is also important for people to have access to healthy food and water, as well as affordable housing and promote safety in their communities.

But apart from being healthy, a city needs to be also liveable. According

to the Encyclopaedia of quality of life and well-being research : "Liveability is the degree to which a living environment fits the adaptive repertoire of a species. Applied to human society, it denotes the fit of institutional arrangements with human needs and capacities. Liveability theory explains observed differences in happiness in terms of need-environment fit" (Encyclopaedia of quality of life and well-being research, 2014).

The World Economic Forum evaluates whether a city is liveable or not based on six main factors: affordability, amenities, connectivity, culture, safety, and sustainability. Accessible public transport, quality education, green spaces, recreational activities and universal accessible healthcare are important elements that a liveable city should have. But rather than fostering and strengthening communities and encouraging the societies to bloom, the modern approach to urban projects have failed to create places that contribute to the liveability a city (Patrizia, n.d.).

So how do we as planners/designers make a city liveable?

The answer is people and their environment, and specifically, how happy people are in the environment they live in, which depends on how we design it. According to Pfeiffer & Cloutier (2016), planners have the possibility to contribute the happiness in a neighbourhood through their design. It is important that a neighbourhood's physical characteristics promotes security, but also space for social interaction, access to green space, and overall a sense of home.

5.1.3 The role of nature in the urban environment

As the urban environments continue to grow and expand, nature has become a key factor in addressing the challenges posed by climate change. Designers and planners often integrate greenery and natural elements into the city's structure not only to create an aesthetically pleasing environment but also to provide shade, retain rainwater, mitigate heat and essentially, enhance the well-being of people. This inclusion of nature and greenery into the urban fabric is primarily supported and guided by frameworks and policies.

One of the main purposes, as mentioned, of nature in urban design is the ability of it to mitigate effects of climate changes. Thus, green spaces like urban forests, green rooftops and (pocket) parks, can lower the temperature cause by the urban heat island effect, by creating shaded areas and at the same time releasing captured moisture into the atmosphere (Gill et al., 2007). This regulation of the microclimate of a city is important not only for the optimum liveability of people but also for the survival of animal and plant species.

Also, trees and plants work as natural capturers of CO₂, as they absorb it through the process of photosynthesis, improving significantly the air quality (Jim & Chen, 2009). Furthermore, green infrastructure is also designed within the city's fabric, for stormwater management purposes: absorbing excess rainwater is important to reduce and risk posed of flooding of the urban area (Gill et al., 2007).

Beyond the climate mitigation effects, green spaces also help improve public health, as mentioned previously. Many studies have shown that green public spaces of quality promote physical movement, enhances the mood and simultaneously reduces stress (Twohig-Bennett & Jones, 2018). Lastly, in the relationship of people vs. nature, green and natural environments provide a podium for

social interaction and community engagement, creating robust and vibrant urban communities (Peters et al., 2010).

Urban green spaces are designed also, to contribute to the preservation of biodiversity of species in the cities. By providing habitats for a number of animals, insects, birds, plants etc., a balance of the city's ecosystem is achieved. Any disruption in the ecosystem may cause various negative effects not only for human but also non-human species. For example, parks and green corridors foster local flora and fauna. If the habitat is disrupted in any way, either by the overpopulation of some insects, or trees being cut down, this has an effect on the entire system, creating an unstable environment, that may be prone to natural disasters (Aronson et al., 2014).

5.1.4 Frameworks and Policies used in the design of urban green

Urban planners and designer, in order to integrate nature into the urban fabric, are often guided by international frameworks and national policies that stress the importance of integrating nature into the urban design. In the European context, the EU Green Deal and the Biodiversity Strategy 2030 highlight the significance of using Nature-based Solutions (NbS) to try and tackle the climate change effects and preserve biodiversity. Through these frameworks, countries of the EU are encouraged to create more green spaces throughout the cities, make rooftops greener and introduce nature-based stormwater management (European Commission, 2019).

In the Netherlands, one of the most important frameworks that emphasize on the importance of developing sustainable urban design and make decisions that lead to climate resilience is the National Environment Vision (NOVI). This document also supports the nature-inclusive design with integrating more green corridors, creating biodiversity-friendly landscapes and introducing wetlands in the urban areas. These suggestions and initiatives align both with the national and EU agenda, promoting greener, healthier and more liveable cities (Ministry of the Interior and Kingdom Relations, 2020).

As mentioned, Nature-based Solutions (NbS) is a concept used in many frameworks and policies in order to promote and stress the importance of designing with nature. It is considered by many stakeholders as an mechanism that is essential to achieve sustainable development. The fundamentals of NbS lay in practices that include forest landscape restoration, integrated water resource management, ecosystem-based adaptation and mitigation, and ecosystem-based disaster risk reduction. But, because of the complexity of the Nature-based solutions, the International Union for Conservation of Nature and Natural Resources (IUCN) developed the Standard, that consists of 8

criteria and 28 indicators, in order to make the process for governments, stakeholders more clear and precise, of what the concept of NbS entails and what is required for it to be deployed successfully (IUCN, 2020).

Despite the development of the Standard with an explanation of how NbS should be used, practically there is no explanation of how a designer can use this in practice when developing a master plan or strategic plan. As a concept, it is a very helpful tool to establish the direction a design will follow, or the goals a design will achieve, but it is a complex concept to integrate, as it requires multidisciplinary approaches that integrate different aspects. At the same time, the evaluation of NbS is also a complicated process for both designers and stakeholders, as the NbS are based on context-specific variables and each context differs. Moreover, many aspects of NbS take time to evolve to be able to evaluate them, and therefore, long-term monitoring is necessary.

Trying to provide a less-complex method for stakeholders and designers to create greener and liveable cities, urban forester Cecil Konijnendijk created the 3-30-300 rule that suggests:

- Every city resident should be able to see at least three trees of quality from their home
- Every neighbourhood should have at least a 30% tree canopy coverage
- Every city resident should have access to a green space within 300 meters, of at least 1ha in size (Browning et al., 2024).

This rule underlines the importance of urban greenery of the mental and physical health of people, providing a basis for designers

when designing for healthy, liveable and sustainable urban environments. The rule is based on simple, measurable metrics that both citizens and stakeholders can easily understand, in order to open a discussion of greening their street/neighbourhood/street.

Through this rule, this project will explore the possibilities of its application in the context of Zwolle, to make the city greener but also provide a thriving environment for human and non-human species, as well as mitigate the effects of climate change.

Chapter 6

Unpacking the 3-30-300 rule

In this chapter the 3-30-300 rule will be explained in detail, as well as all its components. The purpose of this elaboration is to understand the rule, that also works as a guiding tool for this project, its possibilities and also its limitations. Lastly, the design principles will also be presented in this chapter, while in Chapter 6 the application of this tool will take place through the method of Research through Design.

5.1 Overview of the 3-30-300 rule

In 2021, Cecil Konijnendijk, director of the Nature Based Solutions Institute in Wageningen and professor of forestry at the University of British Columbia (Canada), created a rule to promote urban forestry and urban greening initiatives amongst cities.

The principles of the rule are a result of numerous theoretical and scientific studies, as mentioned in the chapter "Theoretical background".

3 trees

"Every resident in every city or municipality should have the opportunity to see at least 3 well-established trees from their home, workplace and school" (Leyssens, n.d.).

30% tree canopy coverage of the neighbourhood

"Every district in every city or municipality must achieve at least 30% canopy cover" (Leyssens, n.d.).

300m to urban green

"Every resident in every city or municipality should be able to reach a large public green space within 300 m or less" (Leyssens, n.d.).

Following this sub-chapter all 3 parameters will be analysed to better understand how they can be used in any context.

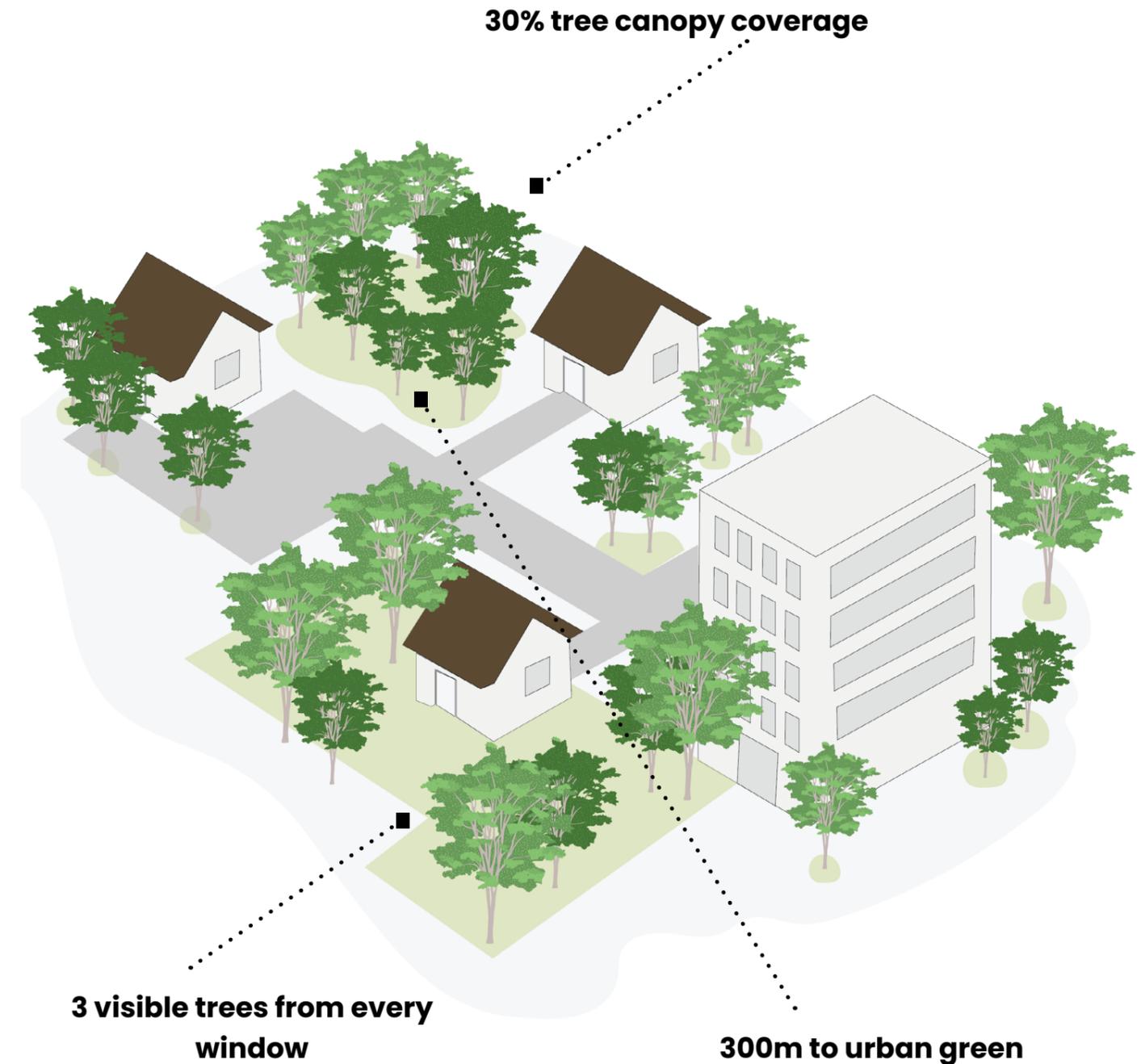


Figure 25: An overview of the 3-30-300 rule
Source: Sabatini, (2024). Adapted by the Author

6.1.1. Aspect 1: The visibility of the 3 trees (A1)

“Every resident in every city or municipality should have the opportunity to see at least 3 well-established trees from their home, workplace and school” (Leyssens, n.d.).

Being able to see green outside your window has been proven to improve stress and anxiety levels, as well as help people recover from illness or an injury relatively faster than in other circumstances (van Iperen et al, 2023). Essentially, the 3 rule is the component that helps improve the mental well-being of the residents (Leyssens, n.d.).

The trees are interlinked with the creation and support of habitats for many species, and as a result, are the main ingredient in preserving biodiversity in an area. When, for example, one can spot birds and butterflies flying around, in a green environment, it has a positive impact on how one sees their outdoors. If it is aesthetically appealing and calm, it is natural to want to be outside and stay there.

Although, the choice of the number “3” does not have a scientific background, it was chosen for communication purposes, to create a phrase that will be easily remembered by everybody.

Furthermore, it is important the proximity of the tree visibility. When the rule states that everybody should be able to see at least 3 trees from their windows, it means that in every building, every windows has tree visibility. This parameter may be hard to achieve, as many windows are overlooking private gardens or courtyards, in which only suggestions regarding the greening of the neighbourhood can be made.

Lastly, either someone lives on the first floor or the 10th floor should also be able to see the same amount of trees. So, it is essential that the urban green should be distributed equally throughout the street/ neighbourhood/city, because all resident have the right to see green (Leyssens, n.d.).



Figure 26: Before - After of seeing at least 3 trees from your windows
Source: Author

6.1.2 Aspect 2: The 30% tree canopy coverage of the neighbourhood (A2)

“Every district in every city or municipality must achieve at least 30% canopy cover” (Leyssens, n.d.).

Through research it has been made known that having at least 30% of tree canopy cover in a neighbourhood improves mental and physical well-being. Studies have shown that being exposed to tree canopies reduces stress, improves the quality of the sleep, and at the same time encourages also physical activity. Social interactions also are encouraged as people can gather under the tree canopies and engage with nature (European Platform Urban Greening, 2024).

Tree canopy cover is has also been linked to strong cooling effects through evapotranspiration, and the shade the trees provide (Greene & Kedron, 2018). Furthermore, if planted correctly and in a strategic way, trees can contribute to the purification of the air, and the circulation of better quality of air in the street/ neighbourhood/city.

In order to understand how much 30% tree canopy coverage is:

- First, the area of which the 30% needs to be covered is determined (in m², km² or ha)

-The formula used to calculate the tree canopy cover is:

Canopy Cover (%) = (Total Area Covered by Tree Crowns / Total Land Area) / 100

- Canopy area: $\pi \times r^2$

For example:

If we have trees of 3m canopy radius, then the canopy area each tree covers is :

Canopy area = $\pi \times r^2 = 3,14 \times (3)^2 = 28.27$ square meters



Figure 27: How 30% coverage of tree canopies looks like schematically in a neighborhood
Source: Author

6.1.3 Aspect 3: The 300m distance from a green space (A3)

“Every resident in every city or municipality should be able to reach a large public green space within 300 m or less” (Leyssens, n.d.).

According to the World Health Organization (WHO), it is recommended that urban residence have access to green spaces at least of 0.5-1ha of size within 300m of their home. This recommendation is based on research that has been conducted over the years regarding the mental and physical health of participants, as well as social health that also is stimulated by the existence of green spaces in urban areas

As mentioned in chapter 4, access to green spaces is also the main component of the Attention Restoration Therapy (ART), as it helps people improve their mental health, by reducing signs of stress, depressions and anxiety.

Furthermore, according to WHO, it is crucial that all resident, regarding their socio-economic status, have the right to equitable access to nature. It is evident in many case studies, that many neighbourhoods lack green spaces, and with the 300m rule this needs to change (WHO, 2023).

Lastly, 300m is a walk of 5-10 minutes, which means the accessibility of green spaces can be achieved by everybody of any age group. In this way, if by walking 5 minutes you find yourself in a green scenery, it becomes part of your everyday life, rather than a weekend getaway destination.



Figure 28: How 300m distance to urban green looks like schematically in a neighborhood
Source: Author

6.1.4 Main components of the rule: Trees

The trees are the main component of the 3-30-300 rule. Essentially, this rule has a very clear guideline: plant trees where possible. But, in order to achieve that, one needs to understand how trees are being planted in the urban environment and what are the parameters to consider when unpaving and planting a tree on the street.

According to Cowi et al., (2013) the street can be divided into three main categories: Small, Medium and Large.

Small trees are up to 10m high, and have a canopy radius of <3m. Their root system is not that extended in comparison to the Medium and large trees, but still can cause damage to infrastructure if not planted correctly. Every tree has to have a distance of at least 3m from the buildings, and between the trees a minimum distance of 3m is recommended, so that the crowns do not touch each other.

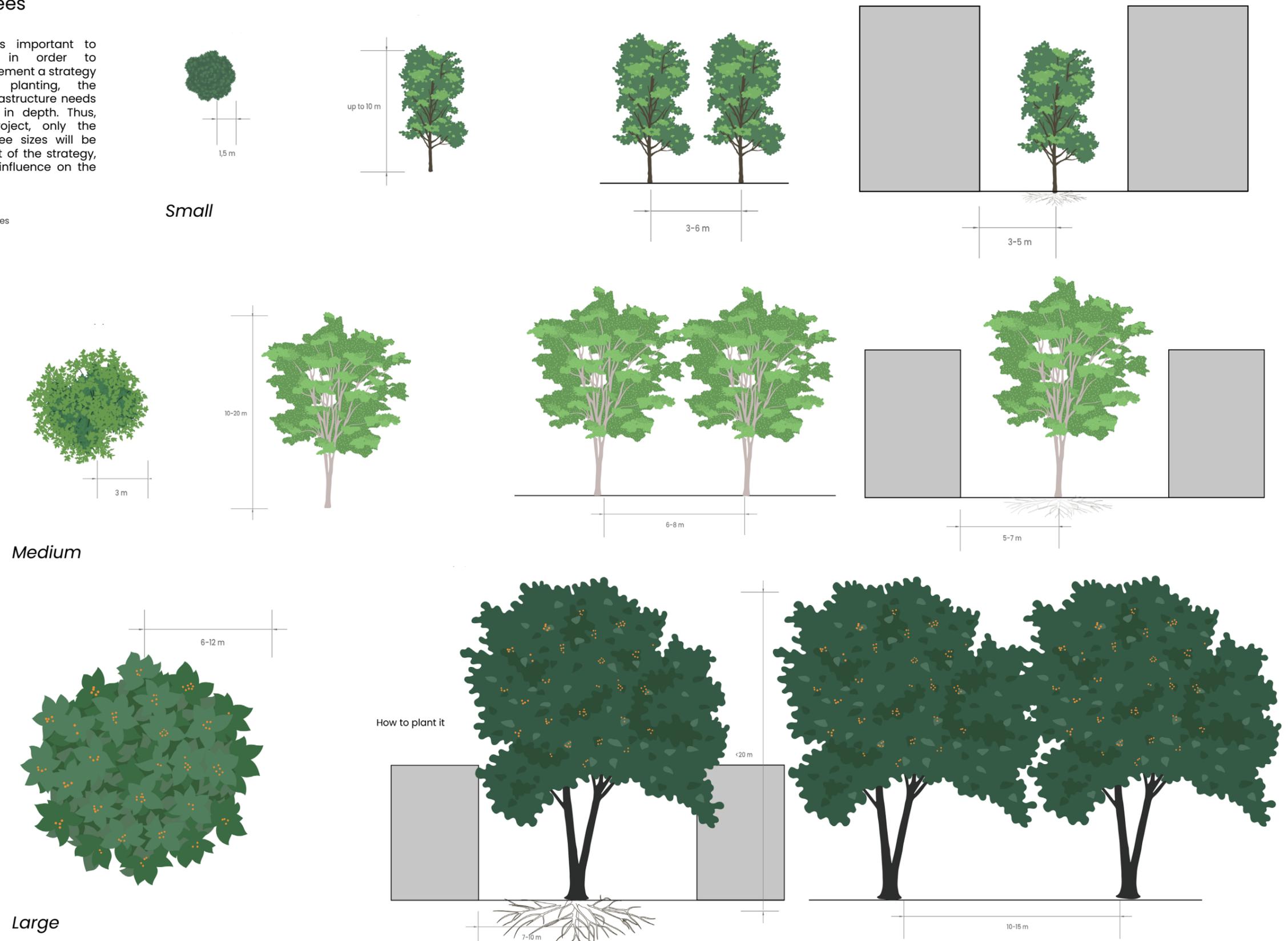
Medium trees are between 10m-20m high, and have a tree canopy radius of 3m-6m. Medium trees offer more shade than small trees, due to their crown size being bigger. It is recommended that medium trees are planted minimum of 5m distance from buildings and at least 6m distance from every other medium tree. Attention: underground infrastructure should be considered before unpaving to plant a medium tree, due to its invasive root system.

Large trees are trees that can be spotted in open areas, as they require a lot of space not only away from buildings but also each other, and due to their root system. Large trees are trees of high quality, as they provide the most of shade in comparison to Small and Medium trees.

Disclaimer: In this project, although the underground infrastructure is taken into consideration, there has been no analysis to locate and investigate either the location or the condition of the underground cables

and pipes. It is important to mention, that in order to successfully implement a strategy including tree planting, the underground infrastructure needs to be analysed in depth. Thus, through this project, only the positions and tree sizes will be proposed as part of the strategy, as well as their influence on the environment.

Figure 29: Tree categories
Source: Author



An important aspect of planting trees is also in which way you place them throughout the site.

Rhythmic planting

Tree rows, with the same species create a “formal” passage for people, bikes, cars. This formality creates also an environment that looks well maintained, safe, and straight forward.



Figure 30: Street tree coverage in Barcelona
Source: Calderón-Argelich, 2020.

Non-rhythmic

The trees are planted in a playful and adventurous way, creating a feeling of a forest. Might become to “cluttering”, and people might feel disorientated and unsafe.

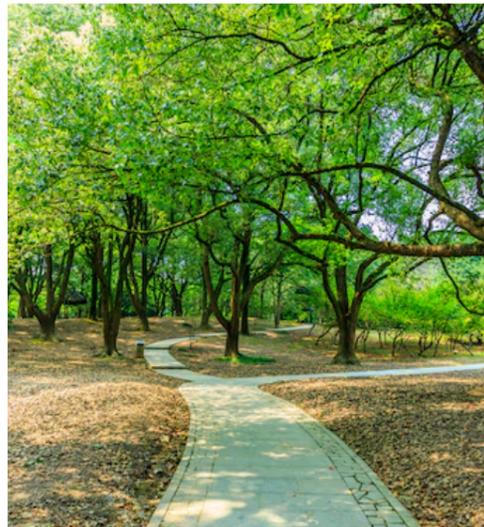


Figure 31: Trees planted non-rhythmically
Source: Freepik | create great designs, faster, n.d.

Cluster

Tree clusters consists of 2 or more trees being planted closely in a circular way. Not a technique that can be spotted in the streetscape but rather in a park or outside the city’s boundary.



Figure 32: Tree cluster
Source: Flickr, 2024.

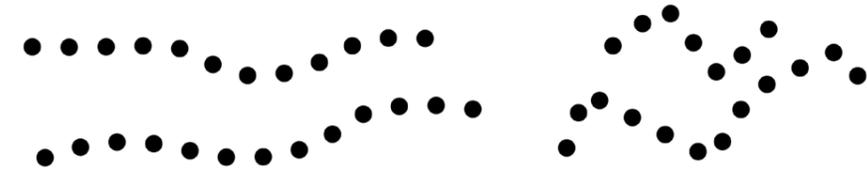


Figure 33: Schematic way of planting trees in the urban environment
Source: Author

6.1.5 Main components of the rule: Proximity to green spaces

Spatial proximity analysis is an essential part of the calculation of the 300m accessibility to urban green spaces. According to Browning et al., (2024), there are four ways to calculate the 300m distance from an urban green space:

Euclidian distance

It can be calculated relatively easier and faster, but does not always reflect the reality: barriers needs to be taken into account when calculating a specific distance. Euclidian distance is usually used to evaluate whether the home is indeed in the 300m radius, but not the actual accessibility (Browning et al., 2024) .

Distance from home to urban green space access point

&

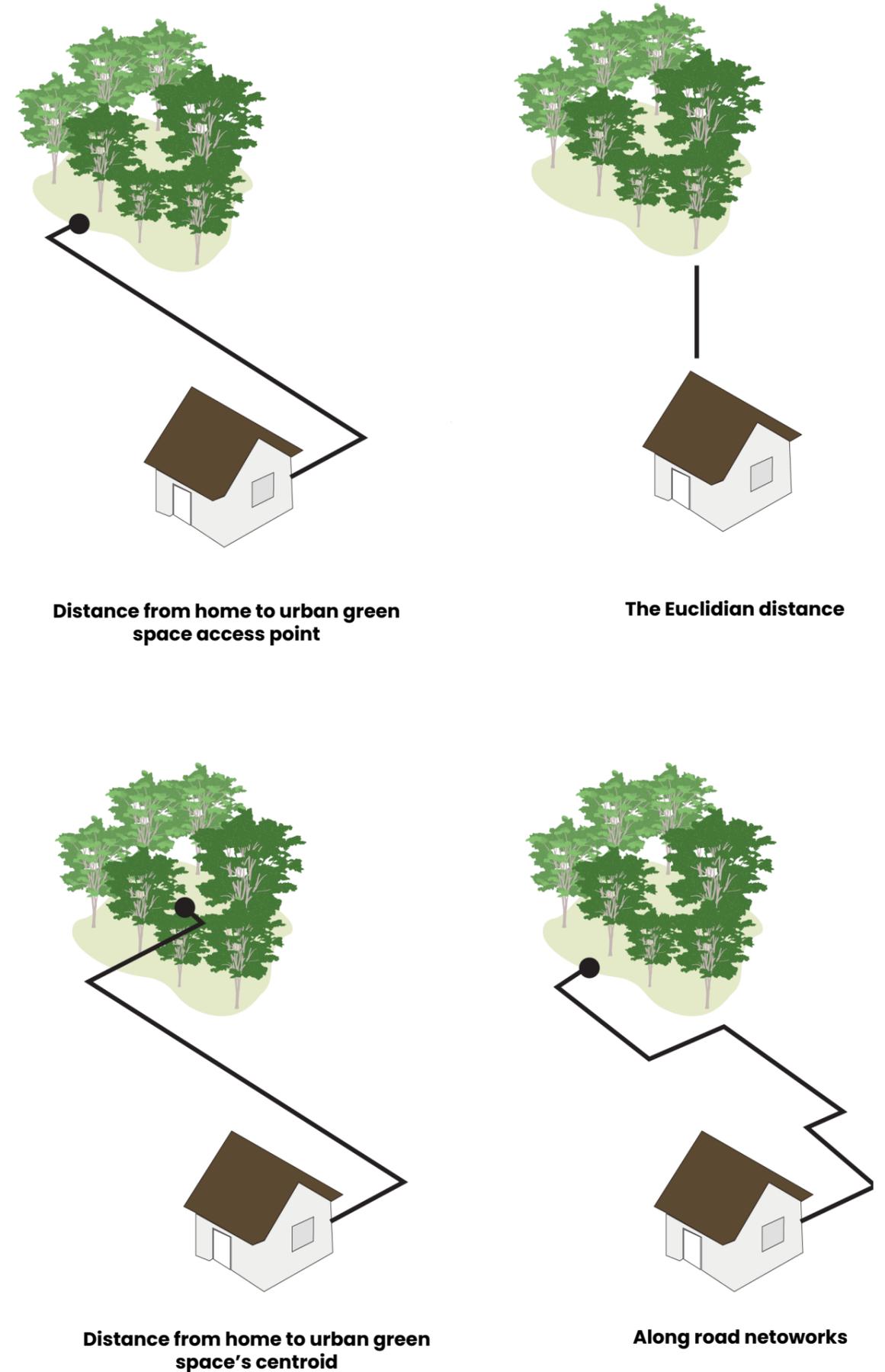
Distance from home to urban green space's centroid

With this method, it is easier to calculate in QGIS the accessibility, as the entrance point is used also as a destination point. Using the geometric centre of a green space (as shown in Figure 3) to calculate distances might not be ideal. For large or irregularly shaped green spaces, this method could result in distances that are either too large or not truly representative of how far people are from the park (Browning et al., 2024).

Along road network

This method is used to calculate the actual travel distance, whether by foot or bicycle. Through Open Street Map, and QGIS, data regarding the road network and functionality can be obtained in order to calculate the desired distance.

Figure 34: Percieved proximity in the 3-30-300 rule, regarding the 300m distance
Source: Browning et al., (2024)
Adapted by the Author



6.2 Application of the 3-30-300 rule throughout Zwolle's street typologies

To understand in depth how actually this rule is used in practice, I will be "testing" the rule's application based on the knowledge developed regarding the research around the different components of the rule.

Firstly, it is important to set the scale in which I will be exploring the 3-30-300 rule. This street is the starting point and an analysis of the different street typologies has been conducted to also apply the rule not only on different street widths but also different street functions.

Zwolle's streets can be categorized in 10 different street typologies based on their function. An average street width has been obtained after analysis through Google Maps and average street widths according to their function have been set in order to research by design. Furthermore, an average length of the street has also been developed based on the analysis through Google Maps: 25m will be the set length of the street which I will use to calculate tree canopy coverage and tree planting options.

The focus streets that were chosen to apply the rule are the Commercial, Residential and Main Neighbourhood streets, due to the fact that the majority of Zwolle consists of residential areas, apart from the city centre.

Lastly, the tree planting options and tree canopy coverage have been decided after thorough literature review. The tree planting options are developed based on the characteristics of the trees (height, tree canopy width, etc.) and not based on specific tree species.



Historic streets/Alleys



Commercial shared



Pedestrian only



Grand streets



Central one-way



Central two-way



Waterfront



Residential



Neighbourhood main street



Industrial

Figure 34 - 44: Photos of Zwolle's streets

Source: Apple Maps, 2024.

6.2.1 Commercial street

Characteristics

Width: 10 – 18m wide

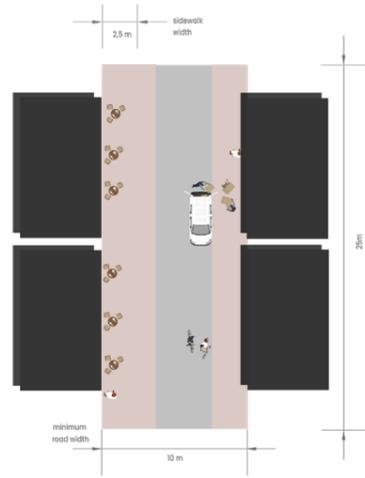
Function: Mixed-use

Pedestrian & Bicycle friendly

Limited access to cars

Dense & compact

Nieuwe Markt, Zwolle



Strengths

- Maximum space for pedestrians
- Low maintenance cost

Weaknesses

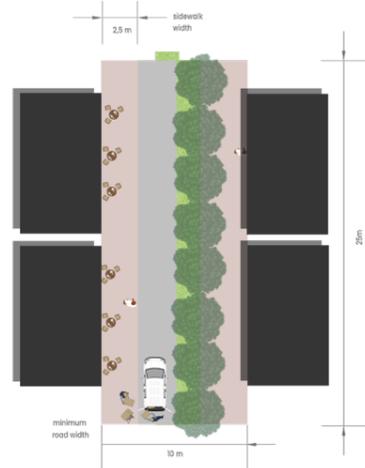
- No shade
- Lack of aesthetic appeal

Opportunities

- Future greening
- Flexible space to meet needs

Threats

- Urban heat island effect
- No one stays on the road, everyone just moves with a destination in mind



- Aesthetically appealing
- Shade & cooling
- Improved air quality
- Biodiversity enrichment

- Limitations in space
- Possible damage to underground infrastructure

- Contribution towards climate resilience strategies
- More people staying in the place instead of just walking past it
- Attractive environment for more businesses

- Maintenance
- Health of trees in threatened by urban pollution, soil conditions, etc.

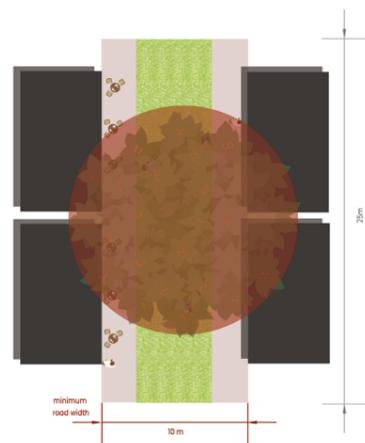


- Maximum space for green
- Enhanced aesthetic impact
- Greater shade

- Space restrains for people's movement
- Higher possibility of damage to underground infrastructure
- No space for logistics

- Climate mitigation
- Increased property value
- Space for children to play

- High maintenance costs
- Risk of damage to the infrastructure



- Not applicable as a large tree needs at least a 7m distance from every building.

6.2.2 Residential street 8m wide

Characteristics

Width: 8-10m

Function: Residential

Shared street for both cars and bicycles, if no bicycle lane

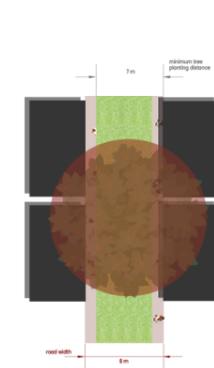
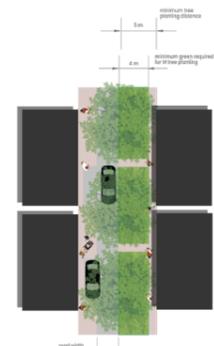
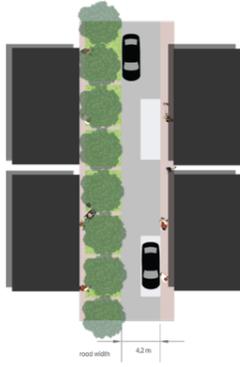
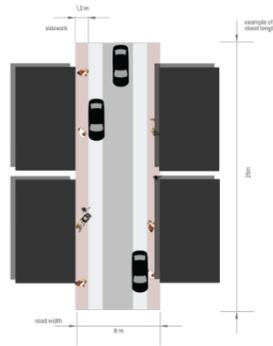
Car-orientated

Parking space on one or both sides of the road

Narrow sidewalks

Nieuwe Markt, Zwolle

Borneostraat, Zwolle



Strengths

- Maximum space for cars
- Low maintenance cost

- Aesthetically appealing
- Shade & cooling
- Improved air quality

- Characteristic aesthetic
- Shade & cooling
- Improved air quality

- Aesthetic enhancement
- Significant shade & cooling
- Improved air quality

- Aesthetic enhancement
- Significant shade & cooling
- Improved air quality

Weaknesses

- No shade
- Lack of aesthetic appeal

- Limitations in space for cars
- Possible damage to underground infrastructure

- Uneven shade patterns
- Non-rhythmic planting can lead to disorderly feeling of the street

- Limitations in space for cars & parking
- Possible damage to underground infrastructure

- Limitations in space for cars & parking
- Possible damage to underground infrastructure

Opportunities

- Future greening
- Transformation opportunities

- Contribution towards climate resilience strategies
- Enhanced livability
- Creation of habitats for species

- Engaging streetscape due to creative design
- This planting option supports diversity microhabitats

- Climate mitigation
- Community engagement opportunities

- Climate mitigation
- Community engagement opportunities

Threats

- Reduces quality of life with no green
- Urban Heat Island Effect
- Poor air quality

- Maintenance
- Damage to infrastructure

- High maintenance & complexity
- Space inefficiency
- Possible lack of space for emergency vehicles

- High maintenance costs
- Damage to infrastructure
- Possible lack of space for emergency vehicles

- High maintenance costs
- Damage to infrastructure
- Possible lack of space for emergency vehicles

6.2.3 Neighbourhood main street

Characteristics

Width: 10-15m

Function: Residential

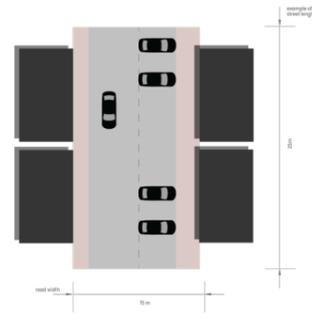
Shared street for both cars and bicycles, if no bicycle lane

Car-orientated

Parking space on one or both sides of the road

Narrow sidewalks

Geraniumstraat, Zwolle



Strengths

- Maximum space for cars
- Low maintenance cost

Weaknesses

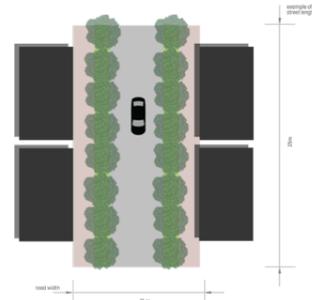
- No shade
- Lack of aesthetic appeal

Opportunities

- Future greening
- Transformation opportunities

Threats

- Reduces quality of life with no green
- Urban Heat Island Effect
- Poor air quality

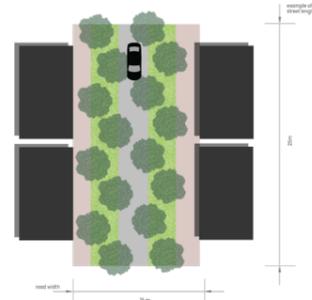


- Aesthetically appealing
- Shade & cooling
- Improved air quality

- Limited Canopy Coverage
- Reduced Environmental Impact
- Potential Interference with Parking

- Contribution towards climate resilience strategies
- Enhanced livability
- Creation of habitats for species

- Maintenance
- Damage to infrastructure

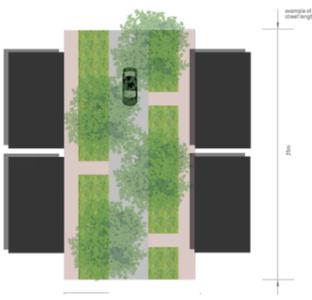


- Characteristic aesthetic
- Shade & cooling
- Improved air quality

- Uneven shade patterns
- Non-rythmic planting can lead to disorderly feeling of the street

- Engaging streetscape due to creative design
- This planting option supports diversity microhabitats

- High maintenance & complexity
- Space inefficiency
- Possible lack of space for emergency vehicles

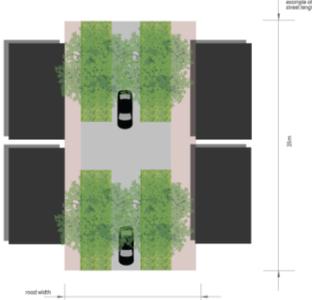


- Aesthetic enhancement
- Significant shade & cooling
- Improved air quality

- Limitations in space for cars & parking
- Possible damage to underground infrastructure

- Climate mitigation
- Community engagement opportunities

- High maintenance costs
- Damage to infrastructure
- Possible lack of space for emergency vehicles

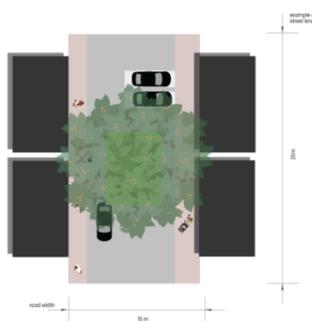


- Aesthetic enhancement
- Significant shade & cooling
- Improved air quality

- Limitations in space for cars & parking
- Possible damage to underground infrastructure

- Climate mitigation
- Community engagement opportunities

- High maintenance costs
- Damage to infrastructure
- Possible lack of space for emergency vehicles



- Significant Shade and Cooling
- High Environmental Impact
- Aesthetic Value

- Space Constraints
- High Maintenance

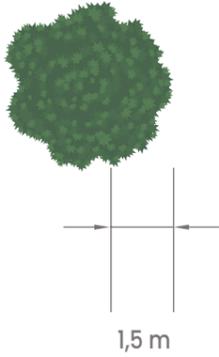
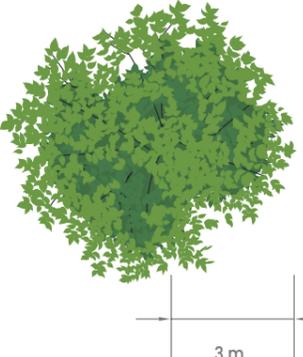
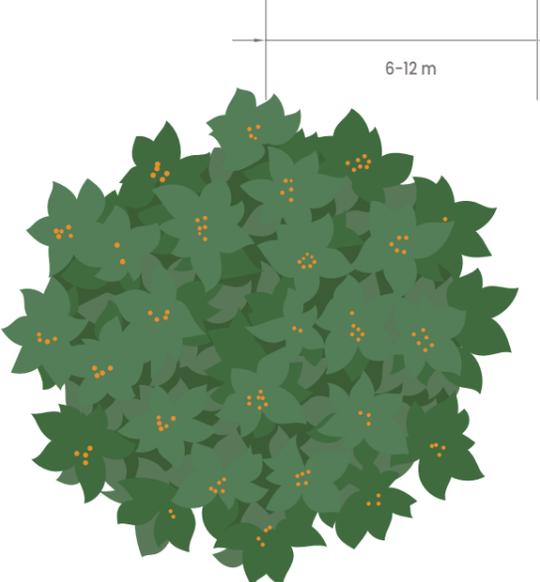
- Climate Mitigation
- Increased property value
- Biodiversity support

- Vulnerability to Storms
- Risk of Damage

Conclusions

The choice of tree size for urban settings should be guided by a balance between the available space, desired environmental impacts, and maintenance requirements. Small trees are well-suited for compact areas, offering limited cooling and ecological benefits. Medium-sized trees represent a suitable compromise for most urban streets, striking a middle ground.

Conversely, large trees provide the greatest environmental advantages but necessitate ample space and ongoing upkeep. Ultimately, selecting the appropriate tree size hinges on factors such as street width, the targeted environmental outcomes, and the municipality's maintenance capacity.

	Strengths	Weaknesses	Opportunities	Threats
 <p>1,5 m</p>	<ul style="list-style-type: none"> • Space Efficient • Low Maintenance • Aesthetic Improvement 	<ul style="list-style-type: none"> • Limited Environmental Impact • Reduced Canopy Coverage 	<ul style="list-style-type: none"> • Increased Flexibility • Biodiversity support 	<ul style="list-style-type: none"> • Urban Stress • Growth Limitation
 <p>3 m</p>	<ul style="list-style-type: none"> • Adequate Shade and Cooling • Moderate Aesthetic Impact • Environmental Benefits 	<ul style="list-style-type: none"> • Space Requirements • Maintenance 	<ul style="list-style-type: none"> • Improved Livability • Biodiversity Support 	<ul style="list-style-type: none"> • Root and Infrastructure Interference • Weather Vulnerability
 <p>6-12 m</p>	<ul style="list-style-type: none"> • Significant Shade and Cooling • High Environmental Impact • Aesthetic Value 	<ul style="list-style-type: none"> • Space Constraints • High Maintenance 	<ul style="list-style-type: none"> • Climate Mitigation • Increased property value • Biodiversity support 	<ul style="list-style-type: none"> • Vulnerability to Storms • Risk of Damage

6.3 The future of Zwolle

The evaluation of different tree planting strategies based on tree size and street characteristics has led to several key findings. These insights can inform the development of effective urban greening approaches that align with the 3-30-300 rule, ensuring that urban trees provide both environmental benefits and aesthetic enhancements in cities.

Tree Size Selection Based on Street Function and Available Space

Large tree species are highly effective at providing shade, improving air quality, and mitigating the Urban Heat Island effect. However, they require wider streets and open spaces with sufficient soil volume to support their extensive root systems. These large trees are best suited for placement along boulevards or primary thoroughfares where there is adequate room for their expansive canopies.

Medium-sized trees can be planted on secondary streets that experience moderate traffic levels but have less available space compared to major roads. These intermediate-sized trees strike a balance between providing environmental benefits and fitting within the constraints of smaller urban areas.

In narrow streets and residential zones where space is limited, small tree species are the most appropriate choice. Although they do not offer the same degree of shade or environmental impact as larger trees, these compact trees can still contribute to the visual aesthetics and local biodiversity of the urban environment.

Street Function Informs Tree Placement and Selection

For major transportation corridors, the strategic placement of large canopy trees should be prioritized where feasible. These sizable trees can effectively mitigate the impacts of heavy vehicle traffic by absorbing

pollutants, providing shade, and enhancing overall air quality along busy streets.

In residential areas with lower traffic volumes, the focus should be on trees that complement neighbourhood aesthetics and support local biodiversity while offering shade and privacy for residents. In these settings, a balanced approach incorporating a mix of small and medium-sized trees can create a pleasant, human-scale environment.

Commercial streets or pedestrian-oriented zones benefit from the strategic planting of trees that do not obstruct movement or visibility but still enhance the pedestrian experience. In these areas, tree species with upright growth habits or columnar forms may be preferred, as they provide shade without limiting commercial activity or visibility.

In summary, the efficacy of urban tree planting relies on the careful consideration of tree size, street function, and available space. A balanced strategy that integrates large, medium, and small-sized trees can optimize both the environmental and social advantages of urban greenery. Thoughtful placement of trees based on the unique needs and characteristics of each street will contribute to the development of a sustainable, liveable, and climate-resilient urban environment.

Development of Design Principles

The insights from the analysis of tree planting strategies based on tree size and street function directly inform the design principles illustrated on the next page. These principles, which include mitigating climate change, preserving local biodiversity, ensuring equitable access to urban green spaces, prioritizing pedestrian mobility, and reclaiming spaces from cars to enhance natural environments, align with the overarching goals of developing a greener, more sustainable urban environment.

The basis of these design principles are rooted not only in the 3-30-300 rule, but also in the need to create an environment that prioritises people's wellbeing and brings nature back into their lives.

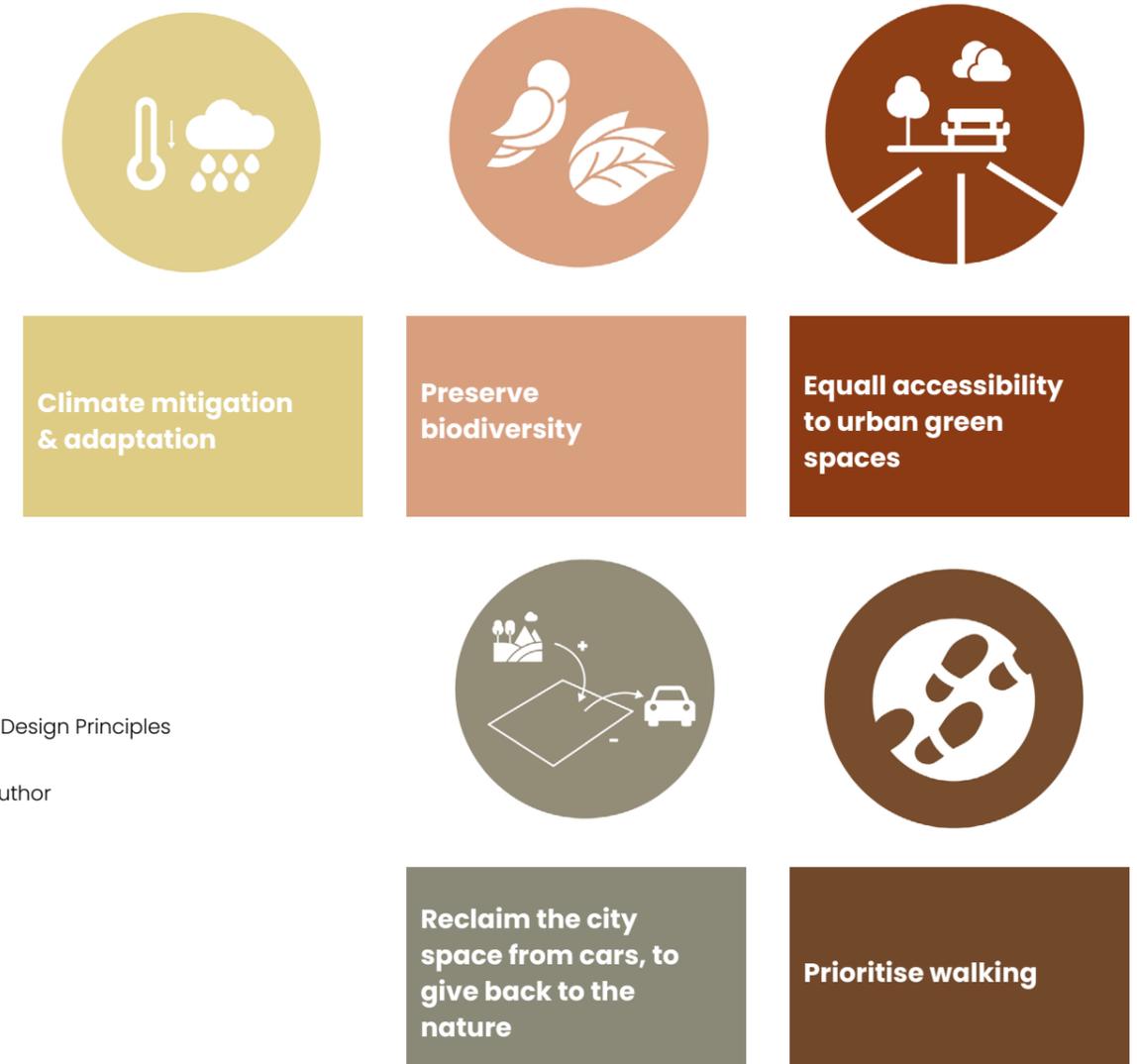
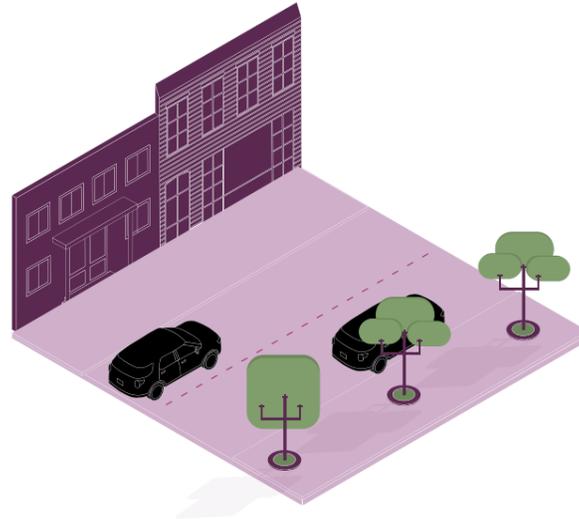


Figure 46: Design Principles

Source: Author

6.3 The future of Zwolle

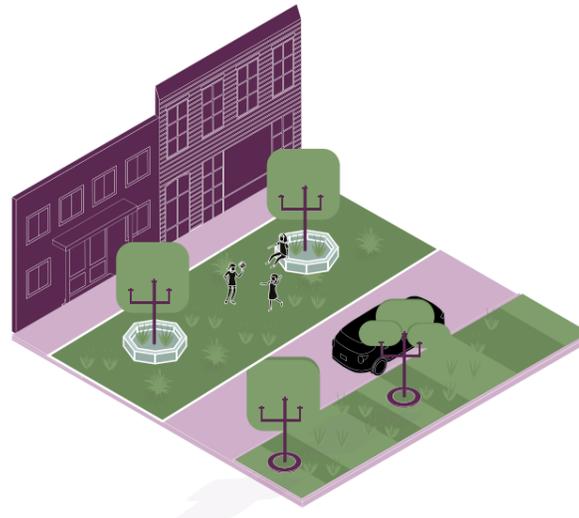
The 3-30-300 rule, which advocates for three visible trees from every home, 30% tree canopy cover, and green spaces within 300 meters of all residents, provides a valuable framework for integrating nature into urban environments. However, simply planting trees, even when strategically done as part of street redesigns, doesn't automatically translate to the creation of thriving, multifaceted urban spaces. To unlock the full potential of urban greenery, we need to move beyond a purely quantitative approach and embrace a more qualitative perspective, focusing on the design of engaging and functional spaces beneath and around these trees.



Here's why quality matters and how urban design can facilitate it:

The Need for Quality Urban Green Spaces

Beyond Aesthetics: While trees undoubtedly enhance the visual appeal of a city, their true value lies in their ability to provide a multitude of social, environmental, and health benefits. A well-designed green space becomes a community asset, fostering social cohesion, promoting physical activity, and offering respite from the stresses of urban life.



Addressing Urban Challenges: Cities face mounting pressures from climate change, social isolation, and a decline in public health. Quality green spaces, designed with these challenges in mind, can contribute to urban resilience by mitigating the urban heat island effect, managing stormwater runoff, and providing spaces for social interaction and recreation.

Equity and Accessibility: Simply having green spaces within a certain radius doesn't guarantee equitable access or use. Design plays a crucial role in ensuring that these spaces are welcoming, safe, and accessible to people of all ages, abilities, and cultural backgrounds.

Designing Quality Spaces Under the Canopy

Multi-Generational Design: Incorporate seating areas with varying heights and configurations to accommodate different age groups and encourage interaction.

Playful Elements: Integrate natural play elements like logs, boulders, and water features to stimulate children's imaginations and promote physical activity.

Community Programming: Activate spaces with events, markets, and workshops to foster a sense of community and encourage regular use.

Community Programming: Activate spaces with events, markets, and workshops to foster a sense of community and encourage regular use.

Mental Health and Well-being

Sensory Experiences: Design spaces that engage multiple senses through fragrant plants, calming water features, and varied textures to create a restorative atmosphere.

Quiet Zones: Incorporate secluded seating areas or labyrinthine pathways to offer opportunities for solitude and contemplation.

Art and Nature Integration: Commission site-specific art installations or incorporate natural elements into the design to create a sense of wonder and inspire reflection.

Environmental Resilience

Stormwater Management: Utilize bioswales, rain gardens, and permeable pavements to capture and filter stormwater runoff, reducing the burden on city infrastructure and replenishing groundwater.

Urban Heat Island Mitigation: Strategically plant trees to provide shade and reduce the urban heat island effect, creating more comfortable microclimates.

Biodiversity Support: Select a diverse palette of native plant species to support local pollinators, birds, and other wildlife, enhancing the ecological value of the space.

By thoughtfully integrating these design elements, urban streets can be transformed into vibrant, multi-functional spaces that enhance the quality of life for residents while contributing to a more sustainable and resilient urban future.

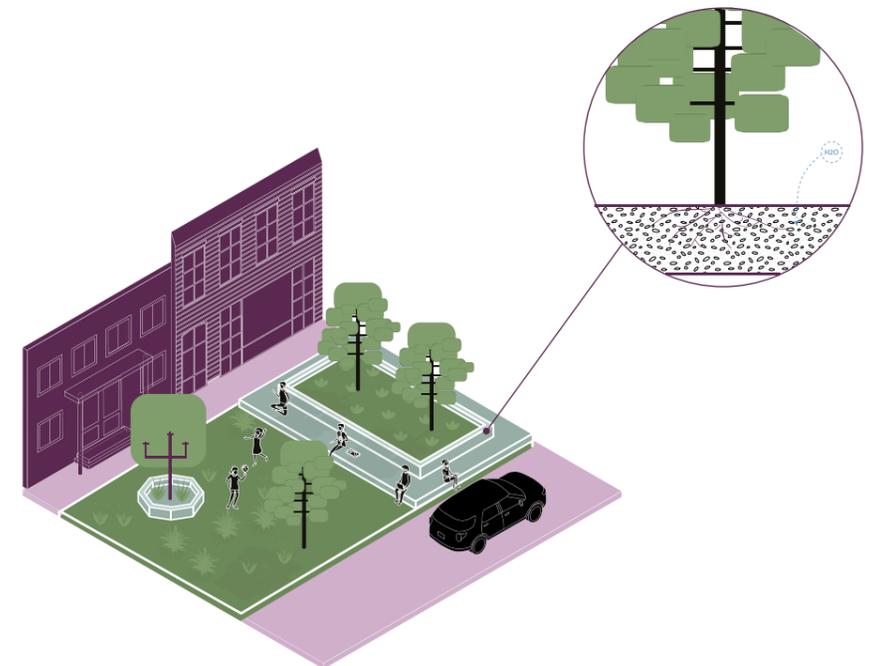


Figure 47 - 50: Quality spaces under the trees

Source: Author

6.4 The benefits of the 3-30-300 rule

The 3-30-300 rule, proposed by urban forestry expert Dr. Cecil Konijnendijk, offers significant benefits when applied to urban planning. This guideline advocates that every urban resident should be able to view three trees from their home, live in a neighbourhood with a 30% tree canopy coverage, and have access to a green space within a 300-meter radius. When effectively implemented, the 3-30-300 rule can transform urban environments in several ways:

Climate Mitigation

Reducing the Urban Heat Island Effect: Increasing tree canopy coverage to 30% helps mitigate the urban heat island phenomenon, where urban areas experience higher temperatures than surrounding rural regions due to heat retention by buildings and roads. Trees provide shade and cooling through evapotranspiration, which can significantly lower surface and air temperatures in cities.

Carbon Sequestration

Trees act as carbon sinks, absorbing carbon dioxide from the atmosphere. By promoting the planting of more trees and increasing green spaces, the 3-30-300 rule contributes to carbon sequestration, helping cities offset their carbon emissions and combat climate change.

Stormwater Management

The presence of trees and green spaces improves natural water absorption, reducing the risk of flooding during heavy rainfall. Tree roots and vegetation help manage stormwater runoff by filtering and absorbing water, thus lowering the chances of pluvial flooding and decreasing pressure on urban drainage systems.

People's Well-Being

Mental Health Benefits: Research shows that visual access to nature—like seeing at least three trees from one's home—can significantly reduce stress, anxiety, and depression. Regular exposure to greenery has been linked to improved cognitive function, emotional well-being, and overall happiness.

Physical Health

Proximity to green spaces encourages physical activity, such as walking, jogging, and cycling. This can help reduce the incidence of chronic diseases like obesity, diabetes, and cardiovascular conditions. Access to parks and green areas promotes healthier lifestyles by providing safe and accessible places for recreation.

Air Quality Improvement

Trees and greenery help filter pollutants, such as particulate matter, nitrogen dioxide, and sulphur dioxide, from the air.

The 3-30-300 rule promotes social cohesion and community engagement by enhancing the liveability of urban neighbourhoods. It ensures equitable access to natural areas, addressing environmental justice issues and fostering social inclusivity. Green spaces serve as community hubs, facilitating interaction and strengthening a sense of belonging. Additionally, greener urban environments are more visually appealing and can increase property values, contributing to overall neighbourhood satisfaction.

Furthermore, the 3-30-300 rule promotes urban biodiversity by integrating more trees and green spaces into the cityscape. Increased tree canopy coverage and green space access create habitats for a variety of wildlife, supporting urban ecosystems and broader ecological health. These green spaces also provide critical

habitats for pollinators, such as bees and butterflies, which are essential for the health of both ecosystems and food supplies. Additionally, trees and green spaces offer crucial ecosystem services, including air purification, water filtration, and soil stabilization, ensuring the resilience and sustainability of cities.

Overall, the 3-30-300 rule offers a comprehensive and holistic approach to urban design, addressing climate change, promoting human well-being, and fostering community engagement and biodiversity. By prioritizing tree visibility, canopy coverage, and equitable access to green spaces, this rule enhances the environmental resilience of cities and improves the quality of life for urban residents, contributing to the creation of healthier, more liveable, and sustainable urban environments for future generations.

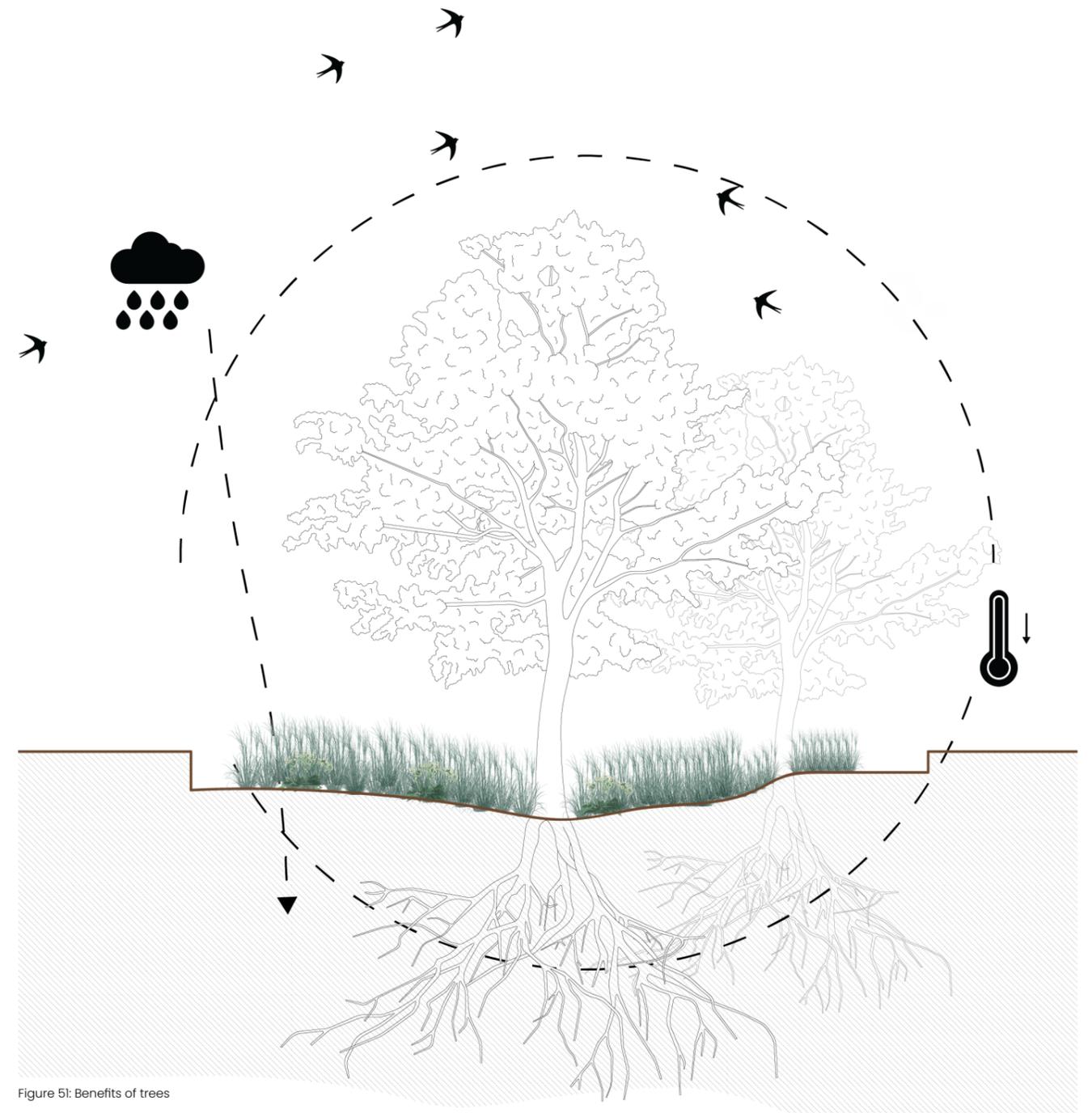


Figure 51: Benefits of trees

Source: Author

6.5 Why the 3-30-300 rule

Konijnendijk's 3-30-300 rule stands out as one of the most effective and widely embraced frameworks for urban design intervention because it offers a simple, actionable, and human-centred approach to integrating nature into cities. Compared to other frameworks like Nature-Based Solutions (NBS), the Green Infrastructure (GI) Framework, and the Sustainable Development Goals (SDGs), Konijnendijk's rule is preferred by many urban planners and designers because of its practicality, measurability, and focus on human well-being.

Why Konijnendijk's Rule is useful in design interventions

Simple and Clear Targets

The 3-30-300 rule provides specific, measurable goals: every resident should see 3 trees from their home, every neighbourhood should have 30% tree canopy coverage, and every resident should be within 300 meters of a green space. This straightforward nature makes the rule easy to understand and apply for both planners and policymakers, compared to more complex frameworks.

Human Focus

Konijnendijk's rule directly prioritizes human well-being by ensuring access to trees and green spaces, addressing issues like mental health, physical health, and social equity. Seeing 3 trees from home has been shown to reduce stress and improve mental health, providing a tangible, everyday benefit.

Measurable Outcomes

The rule offers clear, quantifiable metrics that are easy to track and monitor over time, such as the 30% tree canopy coverage goal. This makes it more measurable than

broader frameworks like the Sustainable Development Goals, which can be harder to evaluate on a community level.

Practical Design Integration

The rule provides a design tool that is integrated into the everyday lives of urban residents, offering affordable and immediately beneficial solutions for integrating green spaces and tree canopy into the urban fabric. This contrasts with frameworks focused on broader ecosystem benefits that may be harder to link to individual or neighbourhood-scale well-being.

3-30-300 rule

Focused on the local urban context.

Offers simpler, community-level interventions that can be more easily adopted by neighbourhoods or cities with limited resources.

Provides more tangible, human-centred targets.

Relatable and easier to implement in urban planning at the community level.

Beyond aesthetics and provides a functional approach to integrating green infrastructure at the neighbourhood and city level, with specific, measurable targets that impact entire urban ecosystems, not just individual buildings or spaces.

Nature Based Solutions

Uses natural processes to address societal challenges like climate adaptation and biodiversity preservation.

Effective for large-scale environmental interventions.

Can be more abstract and less directly relatable to individual urban residents.

Involve complex planning and investment

Green Infrastructure Framework

Prioritizes the creation of interconnected natural and semi-natural areas that provide ecosystem services like stormwater management and urban cooling.

Lacks the explicit focus on human well-being that is central to Konijnendijk's rule.

Emphasizes broad-scale connectivity.

Sustainable Development Goals

Provide a comprehensive, high-level framework for addressing global sustainability challenges

Broad and ambitious

Difficult to translate into practical, local interventions.

Biophilic Design

Focuses on integrating nature into the built environment to enhance well-being and productivity.

Often remains focused on aesthetic or experiential aspects.

Chapter 7

Research by Design

In this chapter the 3-30-300 rule will be explained in detail, as well as all its components. The purpose of this elaboration is to understand the rule, that also works as a guiding tool for this project, its possibilities and also its limitations. Lastly, the design principles will also be presented in this chapter, while in Chapter 6 the application of this tool will take place through the method of Research through Design.

6.1 Analysis

6.1.1 Spatial context of Zwolle

Initial Assessment

The analysis began by mapping and classifying green spaces within Zwolle's city limits. This revealed a concentration of urban greenery in specific areas, primarily large public parks, while a significant portion of the city lacked readily accessible green spaces.

Figure 52: Map of Zwolle

Source: Author, via QGIS



In order to understand how the city functions, a network analysis map was also created, to identify key structures, barrier and connections.

Later in this project, this map is used as a starting point of the street scale design.

Figure 53: Map of road network of Zwolle

Source: Author, via QGIS



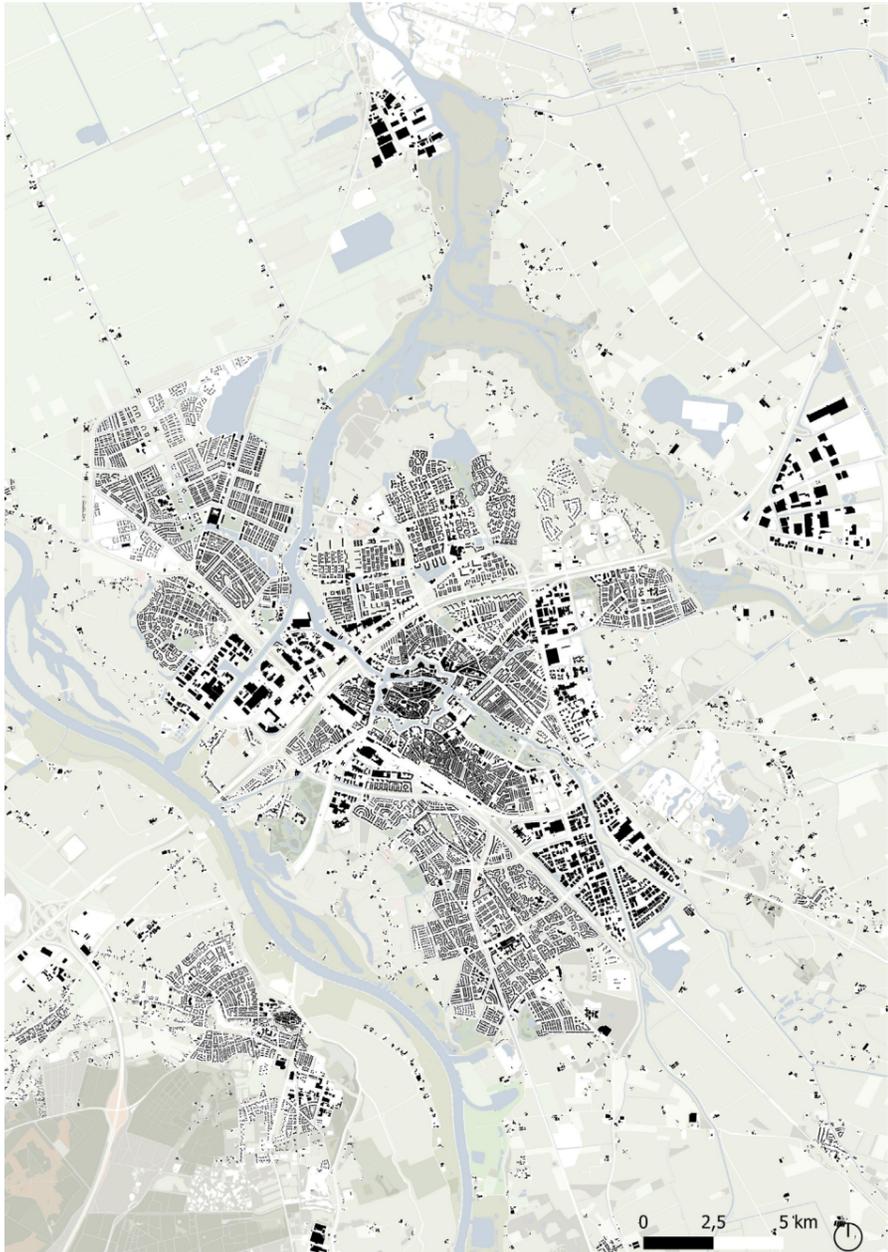
6.1.1 Spatial context of Zwolle

Additionally, a map of the built urban environment was created, to understand how densely built the city is, as well as identify potential plots of lands in the neighbourhood that are unbuilt.



Figure 54: Map of building footprint of Zwolle

Source: Author, via QGIS



Analysing the 300-Meter Radius

Focusing on the “300-meter” aspect of the 3-30-300 rule, a 300-meter radius was generated around each major urban green space. The results indicated that approximately 70% of Zwolle’s residential areas remain outside this radius, highlighting a significant deficit in accessible green space for a large portion of the city’s population.

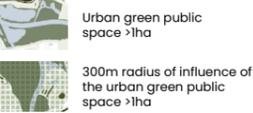
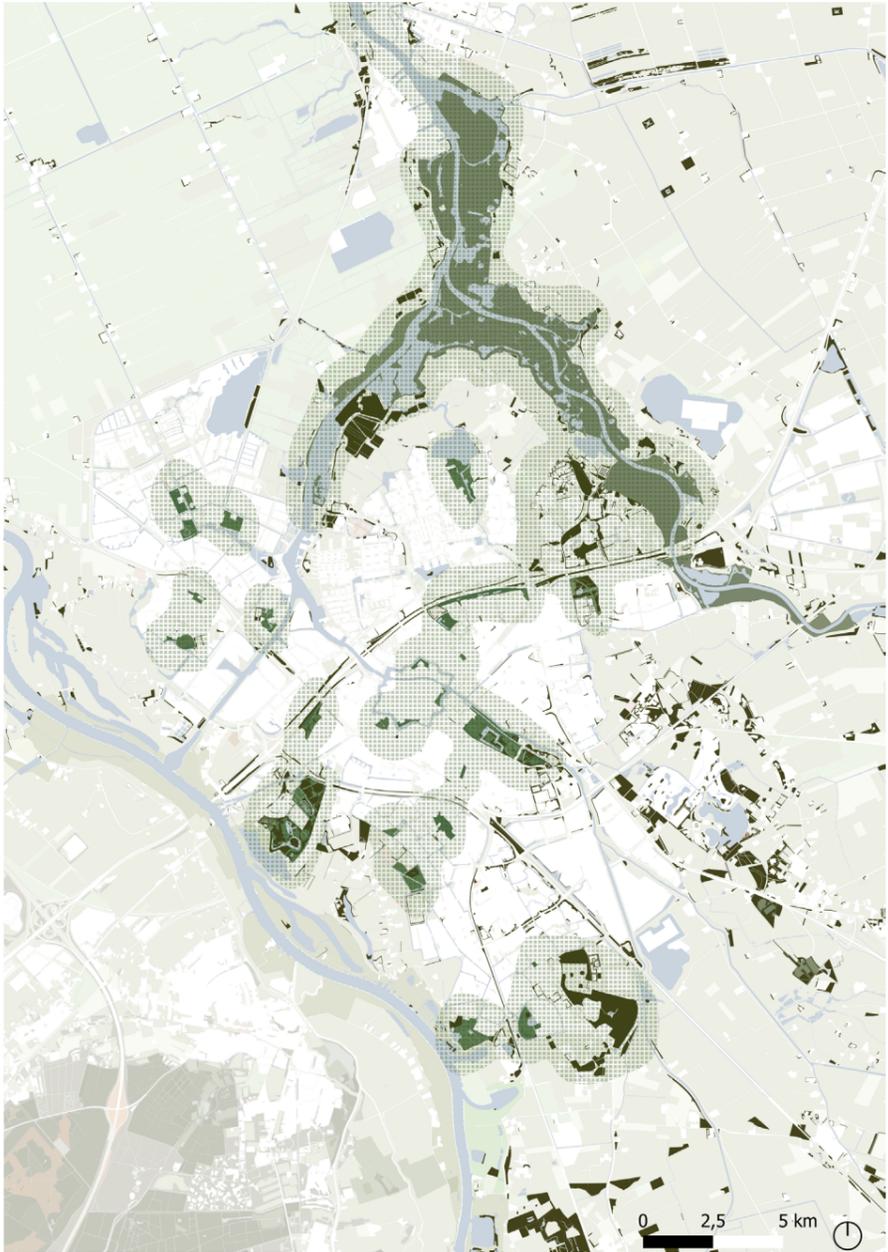


Figure 55: Map of green spaces >1ha and their 300m radius of influence.

Source: Author, via QGIS



6.1.1 Spatial context of Zwolle

Expanding the scope

To explore potential solutions, the analysis incorporated ecologically valuable areas located on the city's periphery. However, even with the inclusion of these areas, a substantial portion of Zwolle (nearly 60%) remained underserved by accessible, high-quality green spaces of 0.5-1 hectare in size.



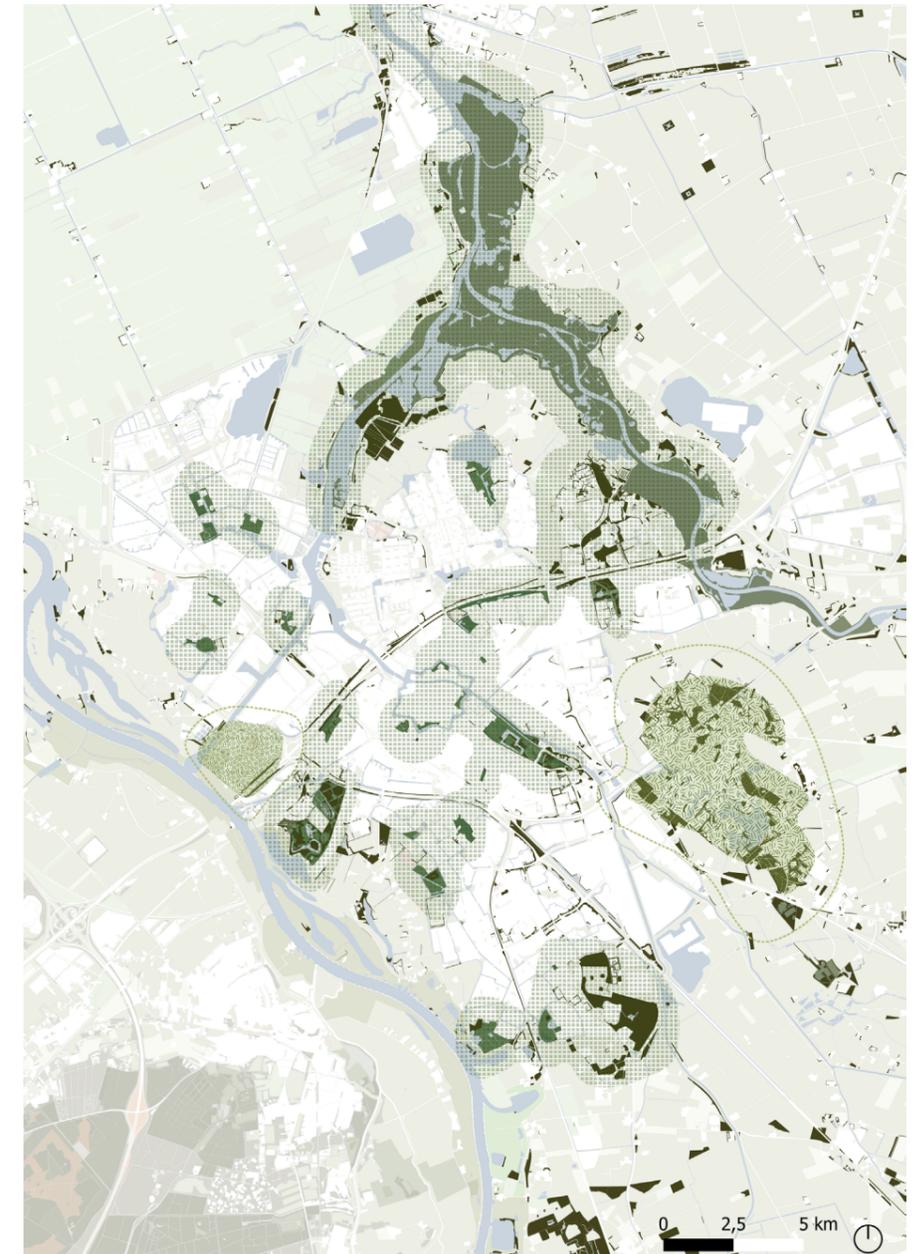
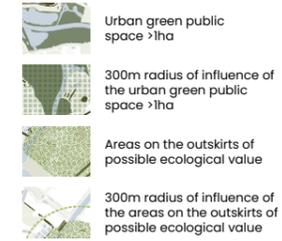
Figure 56: Map of green spaces >1ha and their 300m radius of influence and green spaces on the outskirts of possible ecological value

Source: Author, via QGIS



Figure 57: Map of green spaces >1ha and their 300m radius of influence and green spaces on the outskirts of possible ecological value and their 300m radius of influence

Source: Author, via QGIS



6.1.1 Spatial context of Zwolle

Rethinking Green Space Integration:

Given the limited availability of vacant land suitable for large park development in densely populated neighbourhoods, this study proposes a shift in focus towards integrating green and natural elements into existing public spaces, particularly streets. This approach recognizes the scarcity of large, undeveloped plots and prioritizes maximizing the greening potential of existing urban infrastructure.

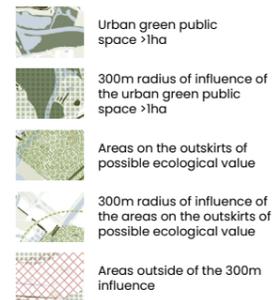


Figure 58: Map of areas without 300m influence of green spaces

Source: Author, via QGIS



Vulnerable neighbourhoods

Extensive research has documented the unequal distribution of urban greenery across neighbourhoods of varying socioeconomic status. Numerous studies have consistently found that affluent areas have greater access to parks, tree-lined streets, and other forms of green infrastructure, while lower-income and marginalized communities often face a significant deficit in access to such green spaces. This disparity in the provision of urban nature has far-reaching implications, influencing physical and mental health outcomes, social equity, and environmental justice across communities.

A study by Schwarz et al. in the journal Landscape and Urban Planning revealed significant disparities in tree canopy coverage in U.S. cities based on neighbourhood income. The researchers analysed 210 U.S. cities and found that socioeconomic factors, particularly household income, were strong predictors of access to urban greenery. Higher-income neighbourhoods were observed to have up to 15% more tree canopy cover than low-income neighbourhoods (Schwarz et al., 2015).

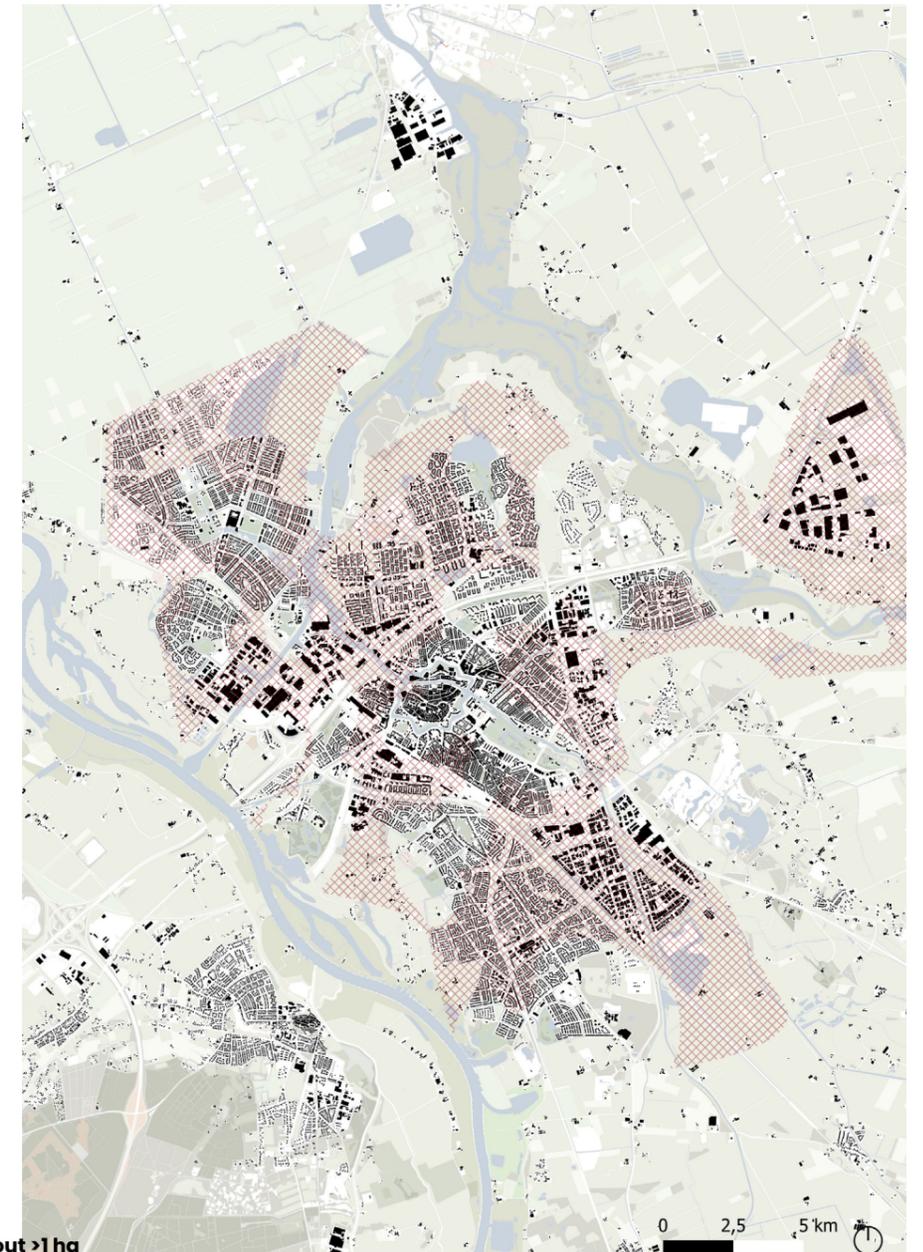


Figure 60: Map of areas without 300m influence of green spaces in relation to building density

Source: Author, via QGIS

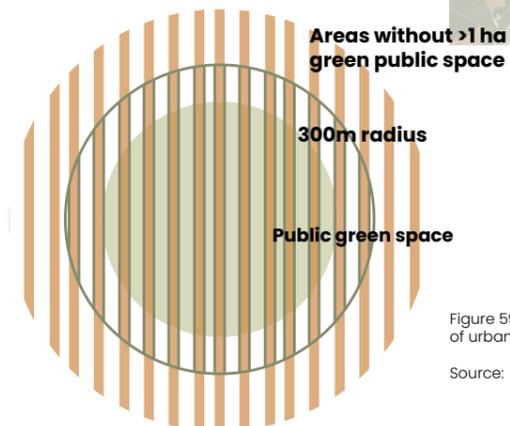


Figure 59: Diagram illustrating the lack of equity of urban green spaces in Zwolle.

Source: Author

6.2 Exploration

6.2.1 Vulnerabilities of Zwolle

As mentioned during the first two chapters of this report, Zwolle, among many other cities in the Netherlands are facing multiple crises at the same time.

In order to understand the spatial context of the climate effect challenges related to the city, two maps of the main crises regarding the environment were created: The map visualizing the Urban Heat Island Effect and the map visualizing the flooding probability of the area by 2050.

As it can be observed, the city centre, together with areas within 400m of it are the most vulnerable ones against both crises. In these areas the neighbourhoods are mainly post-war developments, densely build with limited to no green spaces, as determined previously through the 300m proximity of urban green spaces.

This communities, need to be addressed first when designing of equity of urban green spaces.

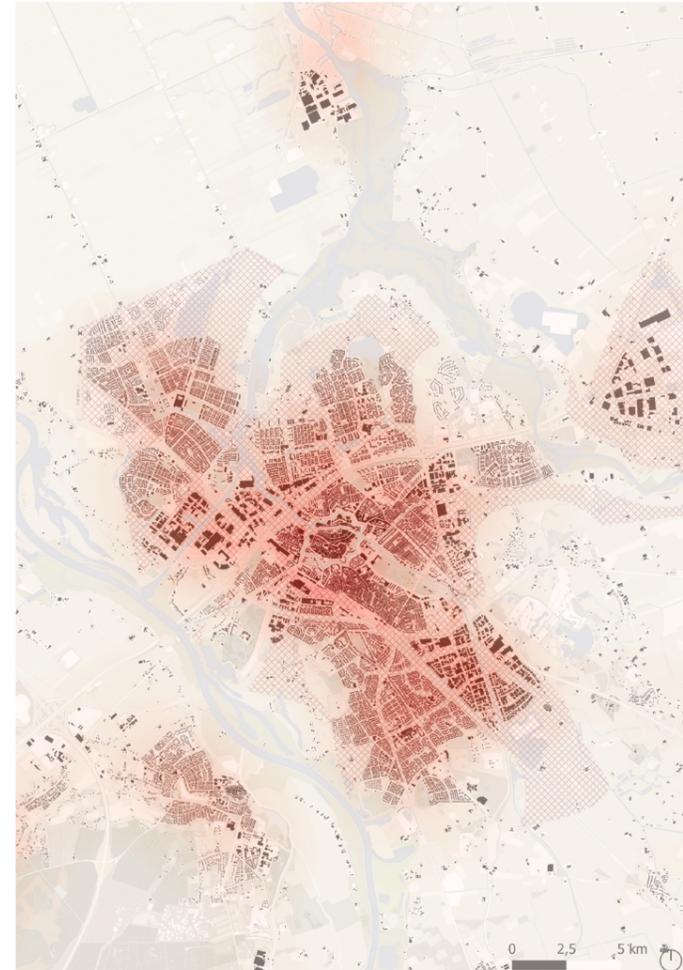


Figure 61: Map of Urban Heat Island Effect in Zwolle

Source: Author, via QGIS with data obtained by Klimateffectatlas

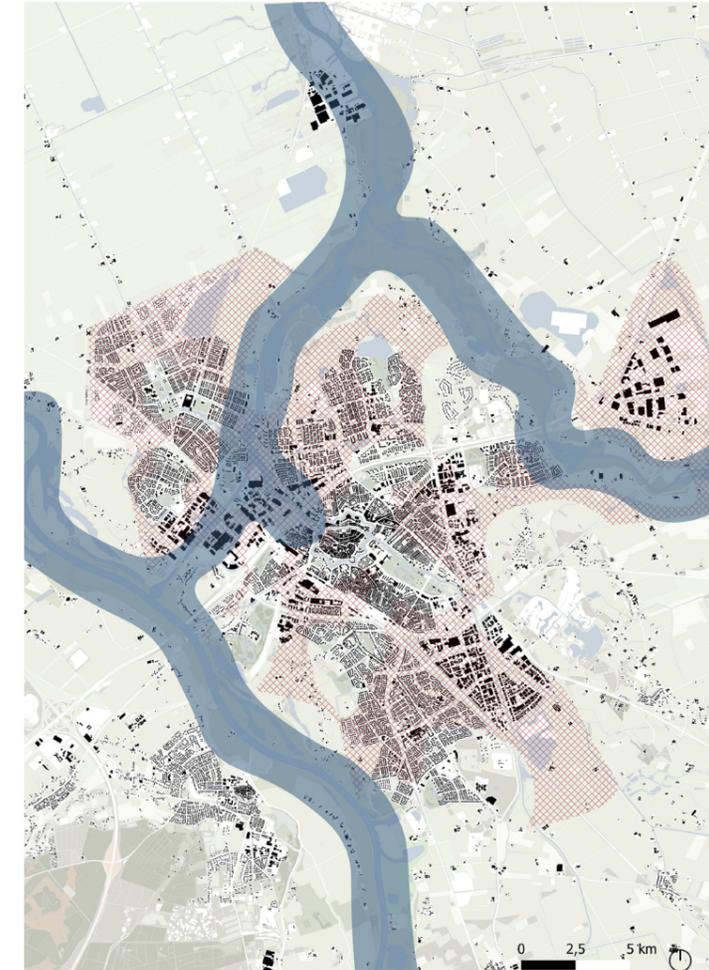


Figure 62: Map of Flooding probability in Zwolle by 2050

Source: Author, via QGIS with data obtained by Klimateffectatlas

6.2.2 Vulnerable neighbourhoods : The case of Kamperpoort

Kamperpoort, a neighbourhood in Zwolle, Netherlands, exemplifies the challenges many urban areas face in providing adequate green spaces for residents. Despite recent urban renewal efforts, Kamperpoort continues to grapple with the legacy of historical planning decisions that prioritized industrial functionality over green infrastructure and resident well-being. This historical context has resulted in a significant green space deficit, impacting the environmental quality and liveability of the neighbourhood (Donze, n.d.).

Several factors contribute to the scarcity of green spaces in Kamperpoort. Firstly, its historical development as a working-class industrial zone during a period when urban planning prioritized economic productivity over environmental considerations resulted in minimal incorporation of parks, green spaces, or tree-lined streets. This industrial legacy manifests in the neighbourhood's dense urban fabric, characterized by high-density housing and commercial buildings, leaving limited space for natural elements. Narrow streets and sidewalks further restrict opportunities for integrating greenery.

Climate Change Challenges in Kamperpoort

Kamperpoort faces significant climate change-related challenges, particularly the Urban Heat Island effect and flooding risk. These issues require urgent attention in urban planning and climate resilience strategies.

Urban Heat Island Effect

Kamperpoort is vulnerable to the Urban Heat Island effect, where dense urban development with concrete and asphalt leads to higher temperatures compared to rural areas. The lack of green spaces and tree cover exacerbates this problem, making the neighbourhood more susceptible to extreme heat.

The Urban Heat Island effect contributes to several problems, including:

- Increased energy use for cooling
- Higher health risks, especially for vulnerable populations, due to heat stress and respiratory issues
- Decreased air quality from ozone production

To address the UHI effect, Kamperpoort should focus on greening public spaces, increasing tree cover, and implementing cooling infrastructure like green roofs and shaded pedestrian areas.

Flooding Risk by 2050

In addition to the UHI effect, Kamperpoort is at risk of flooding due to its location and the likelihood of more severe weather events from climate change. By 2050, projections indicate significant flooding potential, especially if flood defences and water management systems are not improved.

This flooding risk is exacerbated by Kamperpoort's proximity to waterways and its low-lying topography, making it vulnerable to both pluvial and fluvial flooding

To mitigate these risks, Kamperpoort should implement climate adaptation measures, such as:

- Creating blue-green infrastructure like rain gardens and permeable surfaces to absorb water
- Raising awareness and promoting flood-resistant building designs

Kamperpoort's climate change vulnerabilities, including the Urban

Heat Island effect and flooding risk, require urgent action from planners, policymakers, and the community. Strategies focused on green infrastructure, water management, and sustainable urban design can enhance the neighbourhood's long-term resilience and improve the well-being of residents.

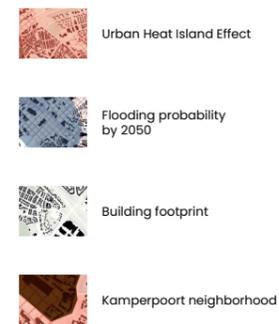


Figure 63: Map of Zwolle's vulnerabilities

Source: Author, via QGIS with data obtained by Klimaateffectatlas



6.2.3 Existing condition in Kamperpoort

The neighbourhood of Kamperpoort has a very low percentage of green in the public space. As it illustrated in the map, there is some greenery on the border of Kamperpoort on the West part, and a few pocket parks.

Furthermore, the absence of greenery in the neighbourhood has contributed to an environment where people, particularly the elderly, may feel isolated due to a lack of spaces to go out and socialize with other community members.

The tree placement is indicated through the dots, but no conclusions can be drawn regarding their size and tree canopy cover, without analysing through Google Maps.

Note: the green and trees analysed in the maps is in relationship to the public space. Data of green located in private spaces could not be found.

The road functions inside the neighbourhood is mainly car orientated, with a sufficient amount of parking spaces. Pedestrians are also dominant, despite the lack of space provided for them.

-  Tree placement indicators
-  Existing urban green
-  Parking place
-  Primary road network
-  Secondary road network
-  Public transport network
-  Bicycle network
-  Pedestrian network
-  Buildings
-  Railway

Figure 64: Kamperpoort in numbers

Source: Klimateffectatlas

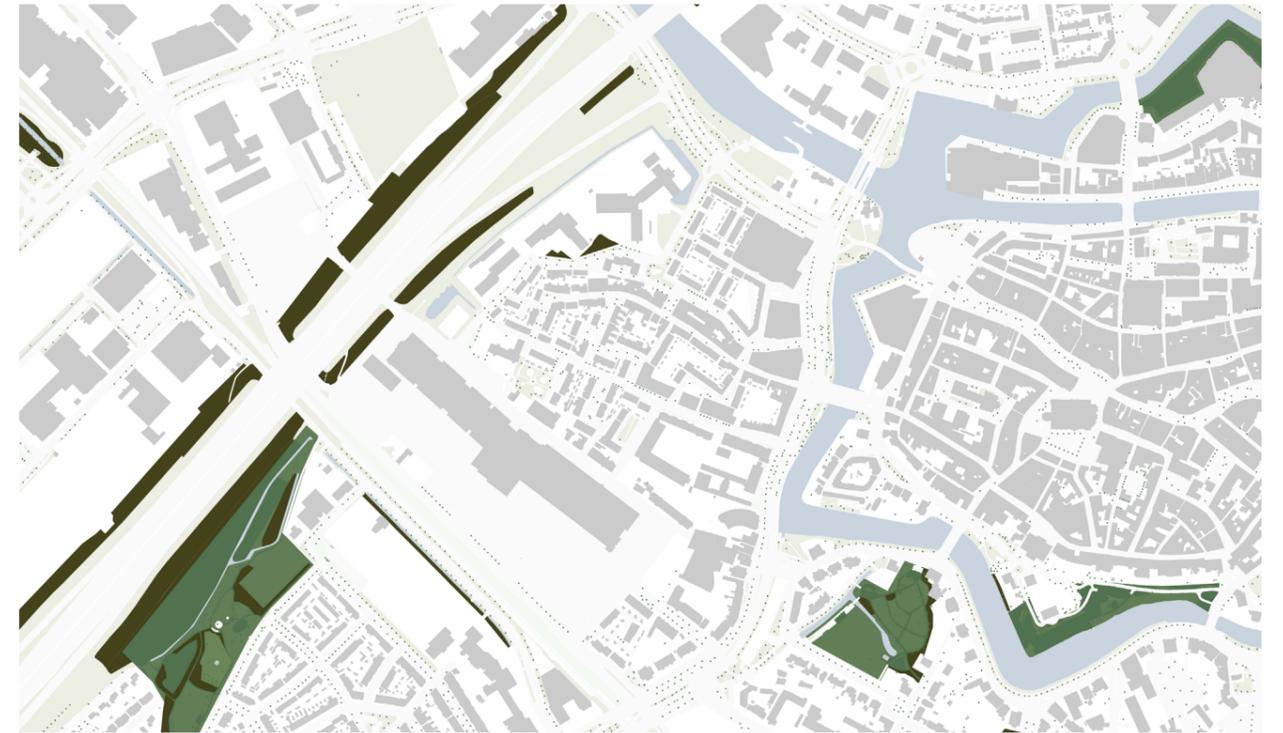
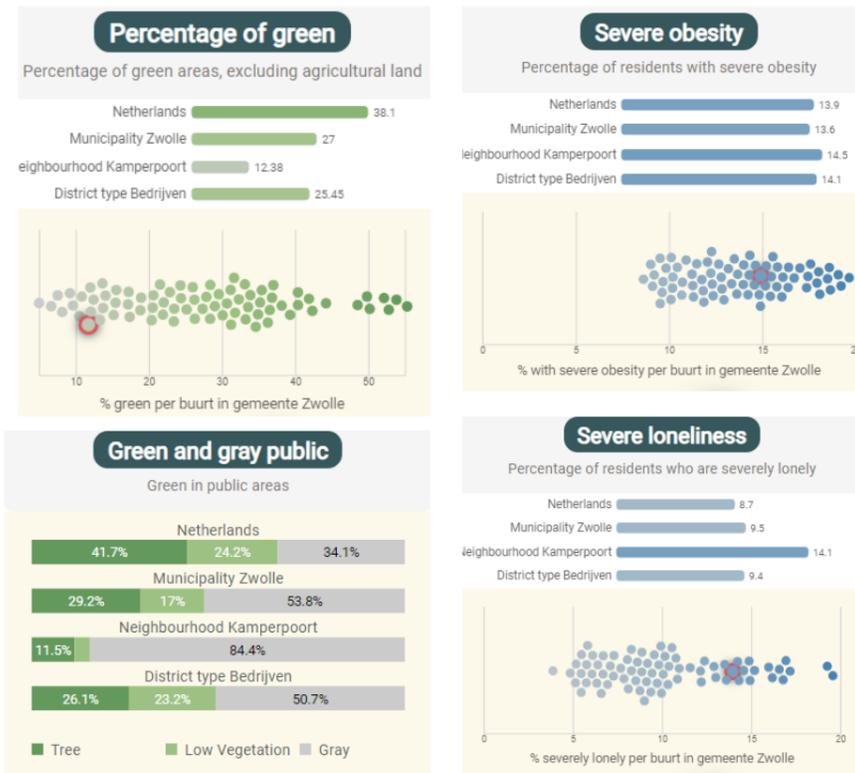


Figure 65: Map of the green in Kamperpoort

Source: Author, via QGIS



Figure 66: Map of the road network in Kamperpoort

Source: Author, via QGIS

6.2.3 Existing condition in Kamperpoort

To integrate more green spaces into a neighbourhood effectively, it is crucial to first understand the neighbourhood's spatial dynamics and movement patterns. This analysis provides insights into how people interact with the space, which areas see the most foot traffic, and where opportunities for greening can be maximized.

Understanding the Movement Patterns and Access Points

My analysis identified the principal access points to the neighbourhood, the main thoroughfares with the highest resident usage, and the secondary roads with lower traffic volumes.

Neighbourhood Access Points

The access points to the neighbourhood are crucial in shaping the movement patterns of people and vehicles. Identifying these entry and exit points provides insights into how individuals navigate the area, which subsequently influences the distribution of activity within the neighbourhood.

Primary Entry Streets

These streets act as the main thoroughfares for both pedestrians and vehicles entering the neighbourhood. They are typically wider and more connected to the surrounding major roads, making them the most heavily trafficked.

Secondary Entry Points

These are less prominent access routes but still facilitate entry into the neighbourhood. These streets may be narrower or predominantly serve residential traffic. They present opportunities for the introduction of green spaces without significantly disrupting the flow of movement.

Movement on Main Streets

The primary streets within the neighbourhood serve as the main thoroughfares for movement, accommodating high volumes of pedestrians, cyclists, and vehicles. These heavily trafficked roads function as the focal points for economic and social activity in the community.

Areas of High Utilization

The streets with the greatest traffic flows are often situated adjacent to commercial centres, educational institutions, or transportation hubs. These high-usage corridors are critical locations for the integration of green infrastructure, such as tree-lined sidewalks, vegetated median strips, and urban pocket parks, which can enhance both the aesthetic appeal and environmental quality of these busy zones.

Implementation Challenges

Incorporating green spaces into these primary streets may face challenges due to the competing demands for road space, parking, and public transit. However, strategically placed green elements, like planters or green facades, could be effective in enhancing the urban environment without causing significant disruption.

Secondary and Infrequently Utilized Roads

Secondary streets or low-traffic corridors present the greatest potential for green space integration. These streets are used less often by residents and frequently function as quieter residential zones, making them well-suited for more extensive greening initiatives.

Opportunities for Greenery

These streets provide the flexibility to implement more ambitious green infrastructure projects, such as linear parks, community gardens, or green buffers. Additionally, the lower traffic flow facilitates the reallocation of space from parking or road lanes to green areas.

Potential to Enhance Connectivity

These less frequently used streets can also be designed to link larger green spaces or parks, creating a green corridor that improves walkability and grants residents access to nature as they navigate the neighbourhood.



Source: Author, via QGIS

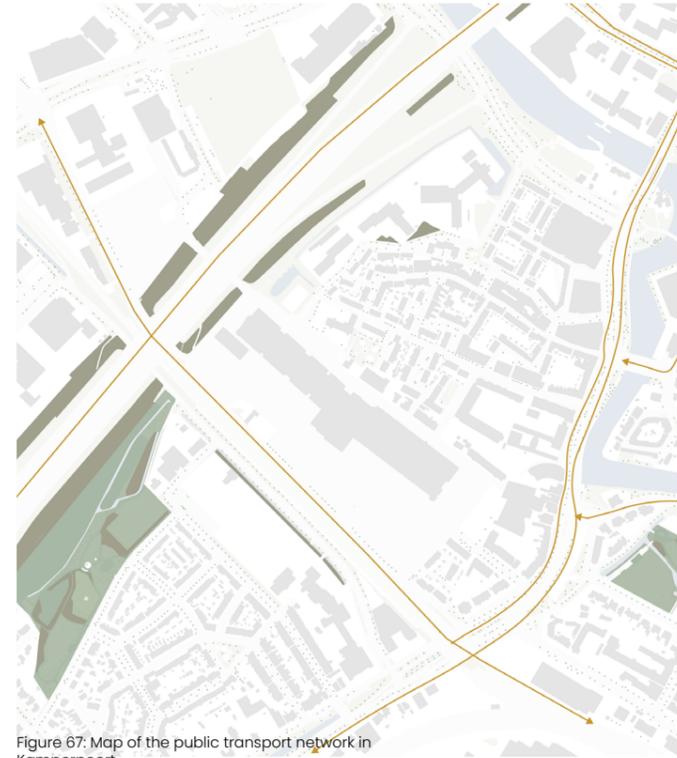


Figure 67: Map of the public transport network in Kamperpoort



Figure 68: Map of the entrance point towards Kamperpoort

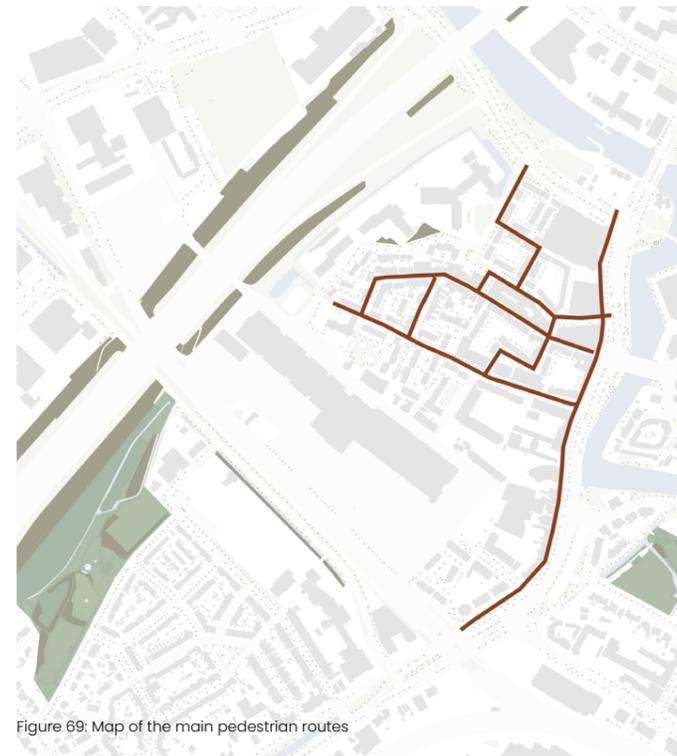


Figure 69: Map of the main pedestrian routes

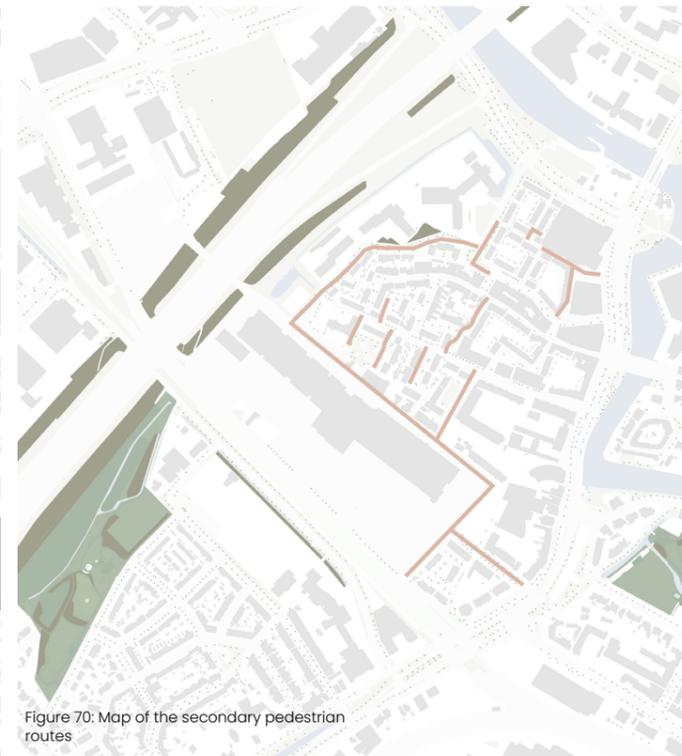


Figure 70: Map of the secondary pedestrian routes

6.2.3 Existing condition in Kamperpoort

To integrate more green spaces into a neighbourhood effectively, it is crucial to first understand the neighbourhood's spatial dynamics and movement patterns. This analysis provides insights into how people interact with the space, which areas see the most foot traffic, and where opportunities for greening can be maximized.

An examination of the masterplans guiding the development of Kamperpoort neighbourhood revealed that while they incorporate a significant focus on green infrastructure, the plans do not fully align with the 3-30-300 rule. This framework emphasizes that residents should be able to view three trees from their homes, live in an area with a 30% tree canopy coverage, and have access to a green space within a 300-meter radius. Analysing the masterplans through this lens provides a valuable assessment of their effectiveness in creating a more sustainable and liveable Kamperpoort neighbourhood.

Evaluating the Masterplans' Compliance with the 300-Meter Green Space Access Standard

The 300-meter green space access standard is an important consideration, as it ensures that all residents have convenient proximity to green areas. The analysis of the masterplans indicates that approximately 80% of the Kamperpoort neighbourhood falls within this 300-meter range, which represents a notable enhancement for the community's accessibility to greenery.

However, a critical gap persists on the eastern edge of the neighbourhood, where residents lack access to nearby green spaces. This area falls outside the 300-meter radius of existing and planned parks, leaving a portion of the population without the benefits of nature. To address this shortcoming, it is imperative to introduce additional green spaces in this part of the neighbourhood. Guaranteeing that all residents, including those on the eastern side, have access to nature is vital for promoting social equity,

physical well-being, and mental health.

Shortcomings in Meeting the 3-Tree Visibility and 30% Tree Canopy Targets

The two masterplans have positively contributed to the neighbourhood's green infrastructure, but they do not fully align with the 3-tree and 30% tree canopy coverage standards. The 3-tree rule stipulates that each resident should be able to view at least three trees from their home. However, the current masterplans appear to prioritize new housing construction over the integration of adequate urban green spaces, resulting in a lack of tree visibility for residents.

Similarly, the masterplans fall short of achieving the 30% tree canopy coverage target. While greenery is incorporated, the extent of tree planting and canopy coverage is insufficient to meet the desired level. Tree canopy plays a vital role in cooling the urban environment, improving air quality, and enhancing biodiversity. Without adequate tree canopy coverage, these benefits are not fully realized. Prioritizing tree planting in the remaining public spaces is necessary to ensure that the 30% tree canopy goal is achieved in the Kamperpoort neighbourhood.

To address the identified gaps and align the development of the Kamperpoort neighbourhood with the 3-30-300 green space framework, the following actions are recommended:

1. Prioritize Green Space Expansion on the Eastern Edge:

The eastern part of Kamperpoort should be the focus for new green space development to ensure all residents have access within the 300-meter standard. This could involve creating pocket parks, or linear green corridors to bring nature closer to the underserved eastern area.

2. Enhance Greening of Public Spaces: While the current masterplans emphasize housing development, the remaining public areas should be maximized for increased greenery. Incorporating more trees along streets, in squares, and other public spaces will help meet the 3-tree visibility target and improve overall tree canopy coverage.

3. Promote Equitable Access and Usability of Green Spaces: Ensuring all residents, regardless of their location within the neighbourhood, have equitable access to nature is critical. Beyond simply meeting the 300-meter proximity standard, the quality and usability of green spaces should be designed to foster community interaction, physical activity, and mental well-being.

4. Develop a Comprehensive Long-Term Greening Strategy: A holistic, long-term strategy should be established to ensure the Kamperpoort neighbourhood achieves the 3-30-300 green space goals. This strategy could include tree planting initiatives, public-private partnerships, and community engagement to sustain and adapt the greening efforts over time.

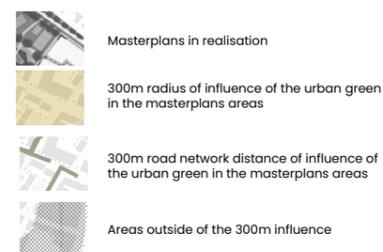


Figure 71: Map of the main masterplans in the making



Figure 72: Map of the 300m influence of green in the masterplans



Figure 73: Map of the 300m road network distance influence of green in the masterplans



Figure 74: Map of the areas not influenced at all by the green in the masterplans

6.2.3 Existing condition in Kamperpoort

As we look ahead to the year 2100, it is plausible that private vehicles will no longer dominate urban spaces, with shared mobility systems becoming the norm. This shift presents a unique opportunity to reclaim urban areas once dedicated to cars and concrete, and repurpose them for nature. In this context, a strategic approach for greening Kamperpoort has been developed, focusing on converting former car infrastructure into green spaces that align with the 3-30-300 rule. This framework aims to ensure that residents can view at least three trees from their homes, live in neighbourhoods with a 30% tree canopy coverage, and have access to green spaces within a 300-meter radius.

The first phase of the planning process involved analysing the main roads within Kamperpoort that experience the highest levels of pedestrian movement. These key streets should serve as the foundation for a green network, as **greening them can create continuous green corridors.** These corridors would not only provide aesthetic and shaded benefits, but also function as ecological connectors, enhancing biodiversity and the overall liveability of the neighbourhood.

The conversion of these main roads into green streets would involve reducing paved surfaces and incorporating street trees, bioswales, and green strips along the sidewalks. This transformation would result in a cooler microclimate, improved air quality, and increased biodiversity, directly contributing to the goals of the 3-30-300 rule.

The next phase of the strategy focuses on reclaiming paved areas currently used for parking, particularly in the courtyards. While these spaces are often perceived as necessary for parking, they represent significant opportunities for green transformation. However, the challenge lies in persuading residents to surrender parking spaces in favour of greenery.

To address this challenge, the strategy involves educating residents

on the substantial benefits of converting these areas into green courtyards. Research demonstrates that access to greenery enhances mental health, encourages outdoor activities, and fosters community well-being. By creating a network of green courtyards, residents can be provided with green spaces in close proximity to their homes, cultivating a sense of ownership and pride in their immediate environment.

These green courtyards can be designed to serve as multi-functional spaces, accommodating relaxation, social interaction, and small-scale community gardening. By gradually building consensus and showcasing the long-term advantages of such green spaces, residents are more likely to support these transformative changes.

Incorporating Masterplans for Urban Greenery

The existing urban green spaces proposed in the current masterplans are crucial components of the neighbourhood's green network. While these masterplans include provisions for greenery and tree canopy coverage, they do not fully align with the 3-30-300 rule. By integrating the green infrastructure from these masterplans with the greening of main roads and courtyards, the neighbourhood will come closer to achieving the desired goals of tree canopy coverage, visibility of trees, and access to parks.

Achieving the 3-30-300 Rule: Engaging the Community

The full realization of the 3-30-300 rule in Kamperpoort will require active participation from residents. Many homes, particularly in post-war housing areas, have windows facing private spaces such as backyards and gardens. Encouraging residents to plant trees and greenery in these private areas is essential for meeting the 3-tree rule and increasing overall

green coverage.

Community involvement will be vital in this process. Through public awareness campaigns, incentives for planting trees, and local gardening initiatives, residents can become active participants in the transformation of Kamperpoort into a greener, more sustainable neighbourhood. This approach ensures that green infrastructure is integrated at both the public and private levels, making the strategy more resilient and comprehensive.

The strategy map for greening Kamperpoort, integrating green streets, green courtyards, and elements from existing masterplans, establishes a foundation for the neighbourhood to fully achieve the 3-30-300 rule. While public projects can drive significant progress, the success of this green transformation hinges on community engagement and residents' willingness to incorporate greenery into their private spaces.

By reclaiming areas previously dominated by cars and concrete, Kamperpoort has the potential to become a model for sustainable urban living in the 21st century. This plan, which envisions a future less dependent on private vehicles, showcases how urban environments can be transformed into healthy, liveable, and nature-rich spaces that prioritize both ecological wellbeing and human welfare. This holistic approach will inform the next phase of masterplan development, ensuring that Kamperpoort evolves into a thriving, green neighbourhood as it moves towards 2100.

Strategy map bringing back nature to Kamperpoort



Figure 75: Urban green strategy development for Kamperpoort

Source: Author

6.2.4 ...but where will I park my car?

This project prioritises pedestrians, and will be proposing a design for a neighbourhood that can function exclusively by walking, while also providing access to bicycles, and occasionally to cars. As it can be seen in the maps, Kamperpoort is very concrete-dominated, and especially from numerous parking spots. As we move towards 2100, it is important to remember that the private car will slowly become extinct, due to strong policies and frameworks.

An proposal of creating shared mobility hubs will be presented in this project, which can be created in collaboration with the existing parking garage facility and a car rental agency of the neighbourhood. By joining forces, an economic opportunity is created for these businesses and the city itself, as by 2100 less and less private cars will be parked in parking garage, and the space left can be used to store vehicles of the shared mobility hub. While the private car is quite dominant until this day, it is important to keep in mind that by prioritising nature and greenery in the urban environment can have many more benefits that having the accessibility to park your car in front of your doorstep. Better air quality, aesthetically pleasing environment, more space to move, play, sit, shade, cooler summer days and nights and many more.

Already it is quite hard to obtain a parking permit from the municipality, and is an extra expense in your monthly budget. Due to all these reasons, the shared mobility concepts is becoming more and more prominent in the Netherlands. Everywhere you can see scooters and bikes that are used by the majority of the inhabitants, as it easy, accessible and cheap. Slowly, the shared mobility regarding the car is also taking up the stage.

As the Dutch government tries to reduce the CO2 emissions by 49% until 2030, shared mobility is a priority on their list, together with the promotion of electric vehicles

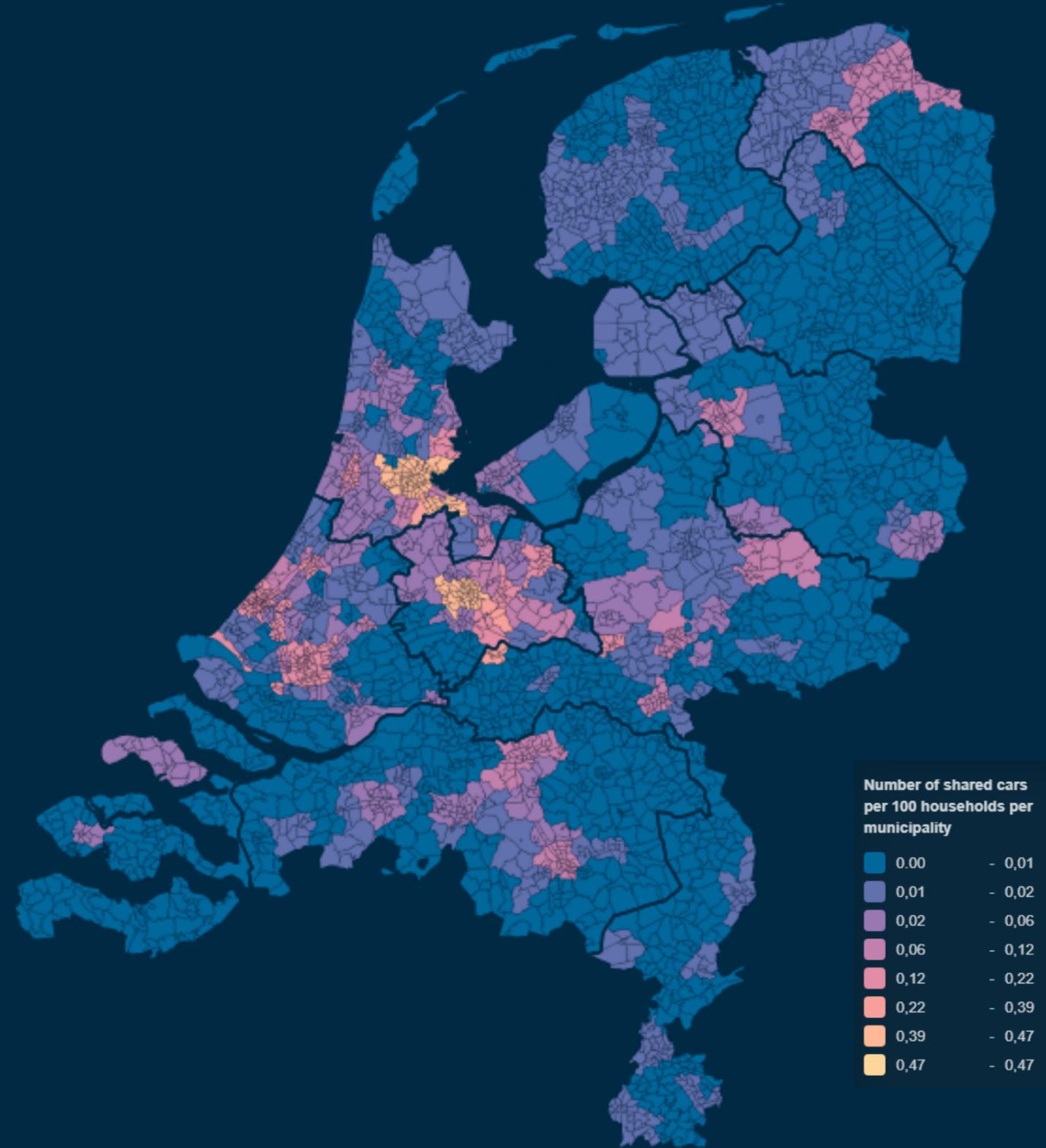
(Ministerie van Algemene Zaken, 2021). Moreover, the pricing of cars is high, making it a product that not everybody can afford. With the shared mobility concept, everybody can have equitable access to a car.

Also, mobility hubs are prominent into becoming an economic cluster for the city/neighbourhood, creating new job opportunities, but also, a social cluster, where people meet and engage with each other.

Lastly, society's view on walking needs to change. Less and less people walk, as their everyday lifestyle is fast paced, and everybody want to get to their destination in the quickest way possible, but we have forgotten to stop for a minute, and enjoy...enjoy the sun, the air, the birds, even the rain.

Figure 76: Map of shared mobility use in the Netherlands

Source: Ministerie van Infrastructuur en Waterstaat (2024)



Kamperpoort Bloom

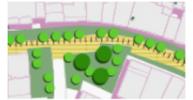


Figure 77: Masterplan for a greener Kamperpoort
Source: Author

6.2.5 Unpacking the elements of the proposed masterplan



Main pedestrian street, with medium tree planting. It is important that although the car comes last, it still has access to the street.



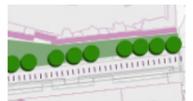
Main pedestrian street, with small trees only on one side planted. Still room for car to pass, but mainly pedestrian oriented and then the bicycle. Purpose of the street is to feel free in front of your house.



Areas that are currently under development (within masterplans) of the Municipality. These areas are going to contribute for 15–20% of the tree canopy coverage of the neighbourhood.



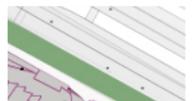
Large trees that are planted according to the parameters introduced in Chapter 5.



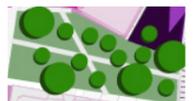
Medium trees that are planted according to the parameters introduced in Chapter 5.



Small trees that are planted according to the parameters introduced in Chapter 5.



Areas with just grass, flexible to be used by the citizens according to their needs.



Urban small public green space, functions as a mini plaza.



Courtyard urban green, where people can also be part of the preservation of greenery.



Playgrounds for children within the urban greenery.



Mobility hubs as a turning point for the usage of private cars. In collaboration with the parking garage and the car rental agency, the mobility hubs can become an economic opportunity for the neighborhood, and replace the privately owned cars.



The parking garage, as we step into 2100, will be less crowded, as there is a shift happening already towards shared mobility. The parking garage can be used as a shell to accommodate not only private vehicles but also shared mobility vehicles.



The assisted living facilities are an important epicenter of Kamperpoort, because many old people that live there tend to feel lonely or unhappy. It is important to provide also for them an environment where they can interact, feel part of the community and benefit from the urban green.



The outdoor space of the sports association, which is mainly paved, can be used to create a vibrant green urban environment, where children can play and exercise at the same time.



The car rental facility can be used, in collaboration with the parking garage and the municipality to become part of the shared mobility initiative, and slowly help people replace their individual car with a shared one.



The supermarket plays a big role in a neighborhood, as it is a place where people tend to interact daily, and therefore, it should be part of the urban greening strategy.



The retail center, being located on the edge of the neighborhood, is a starting-point for all resident both the neighborhood and the ones coming from the city center. People should be able to sit outside and enjoy their time, while taking a breathe under trees.

Zooming in

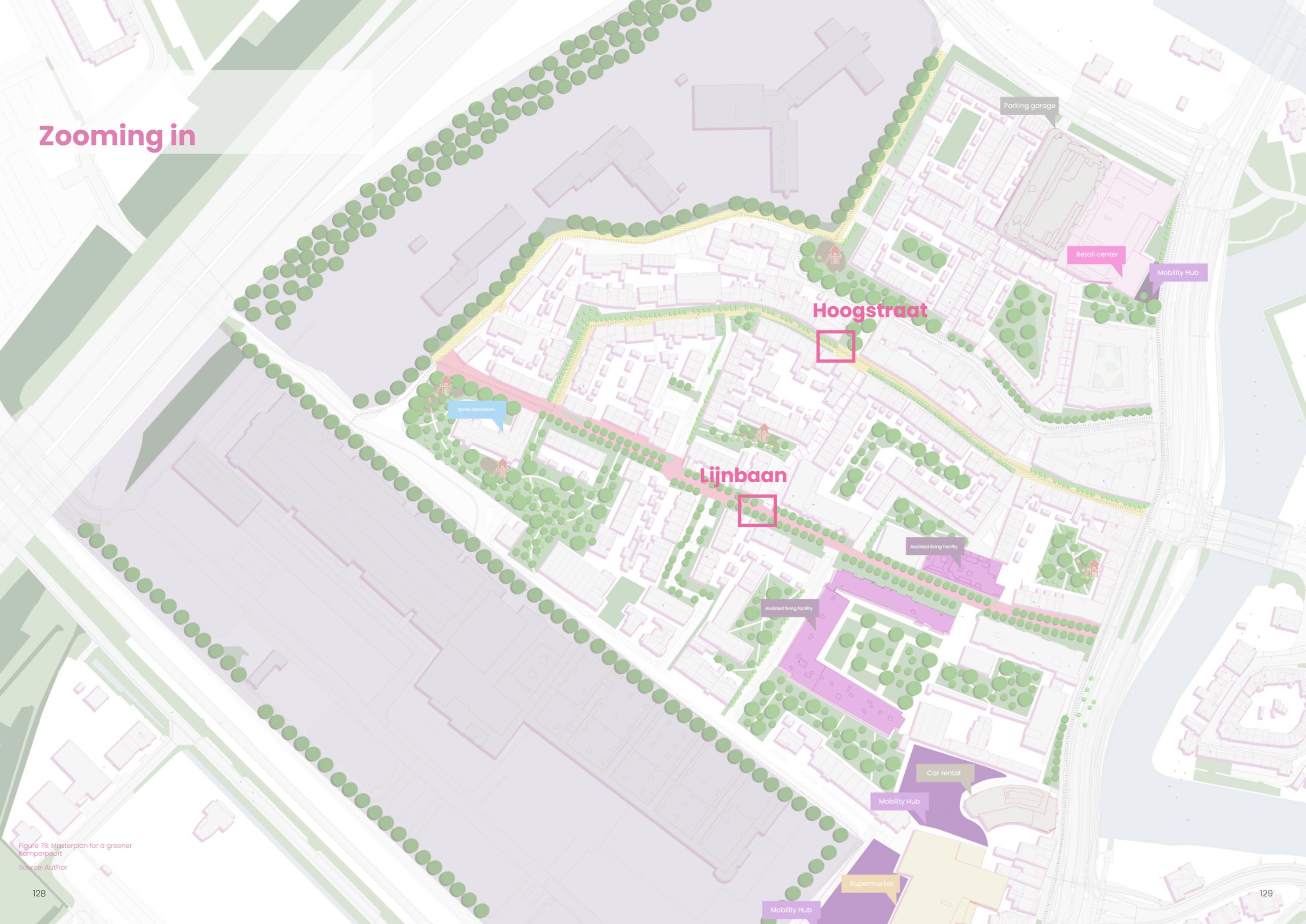


Figure 78: Masterplan for a greener Kamperpoort
Source: Author

6.2.6 Street Design: Lijnbaan

Looking through Lijnbaan nowadays, one can see a very narrow street, that already suggests that the car is not the priority here. Very wide paved sidewalks, with very little green and small trees can be spotted, while the parking is also quite dominant.

The transformation of Lijnbaan is the most important one of this neighbourhood, as it is one of the two streets that can be characterised as the "backbone" of this neighbourhood regarding streets. The majority of people use Lijnbaan everyday to pass through the neighbourhood and go into the city centre and vice versa.

Furthermore, Lijnbaan is an important street for enhancing the community feeling, as it hosts two assistant living facilities, where people can feel quite lonely from time to time. It is important when designing, that every group's needs are addressed, even if they are not the majority of the neighbourhood. **Inclusivity is the key for a resilient and healthy community.**

Lijnbaan is being re-designed as the green street it deserves to be: **Medium trees of size are planted, and space for green is created by unpaving the parking spots.**

As we move towards 2100 it is important to **change the paradigm of the private car**, and focus on alternative ways of transportation.

Shade, cooler environment, rich in plants, trees and species now exists in the heart of Kamperpoort. Everybody can enjoy a walk through the main street, as it is mainly pedestrian focused.

The car may enter with maximum speed of 20 km/hour but is not welcomed to stay. The road is shrunk to the minimum required width so that vehicles of emergency can pass through.

Figure 79: Lijnbaan plan + section - before

Source: Author

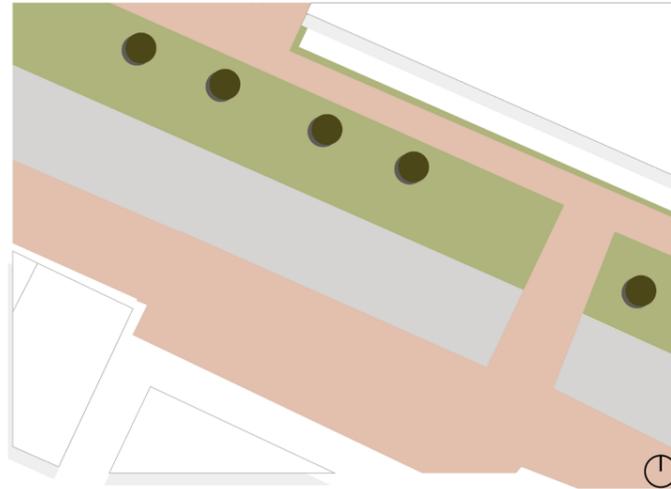
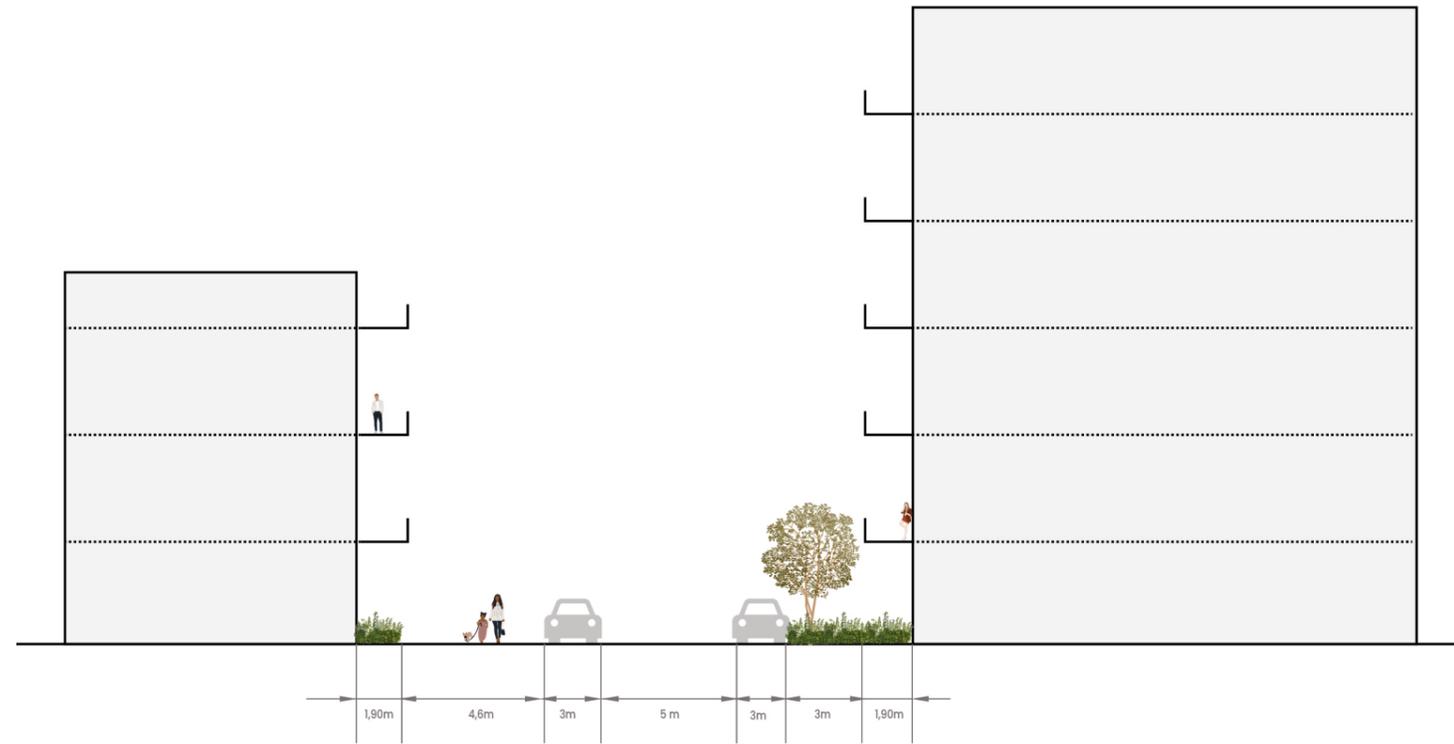
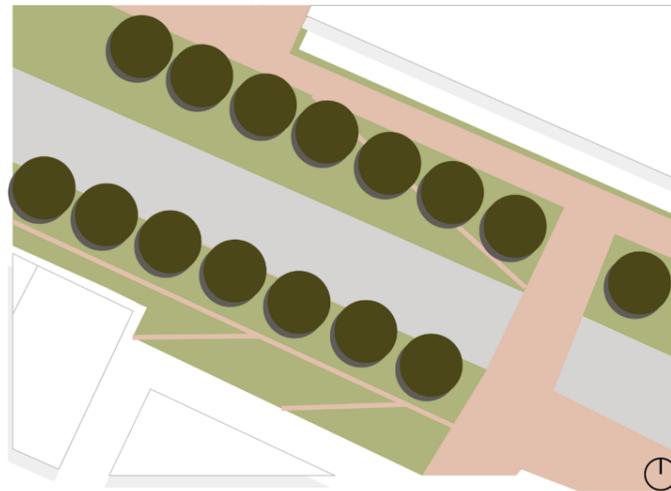


Figure 80: Lijnbaan plan + section - after

Source: Author



Street Design of Lijnbaan



Figure 81: Impression of Lijnbaan in 2100

Source: Author

6.2.7 Street Design: Hoogstraat

Hoogstraat nowadays, is mainly a paved narrow street (8m wide) that does facilitate mainly cars and parking spots.

Very narrow sidewalks, do not provide an inclusive environment for all residents. Lack of greenery is also evident throughout the street.

The re-design proposal of Hoogstraat lies in the main idea to transform the function of such narrow streets and create a pedestrian friendly streetscape. Although Hoogstraat seems like a narrow, underused street, the reality is that on the East side of the street, the main entrance point to the neighbourhood from the street centre is located.

The vision in this transformations lies into creating liveable, vibrant, green and functional streets where people can walk without interruption, children can play in front of their homes.

Small trees of size are planted one side of the road, creating a formal passage for people to walk through.

Shade from the trees contributes to a cooler environment, in comparison to the previous conditions where the entire street was without green and almost entirely paved.

The car may enter with maximum speed of 20 km/hour but is not welcomed to stay. The road is reduced to the minimum required width so that vehicles of emergency can pass through.

Figure 82: Hoogstraat plan + section - before

Source: Author

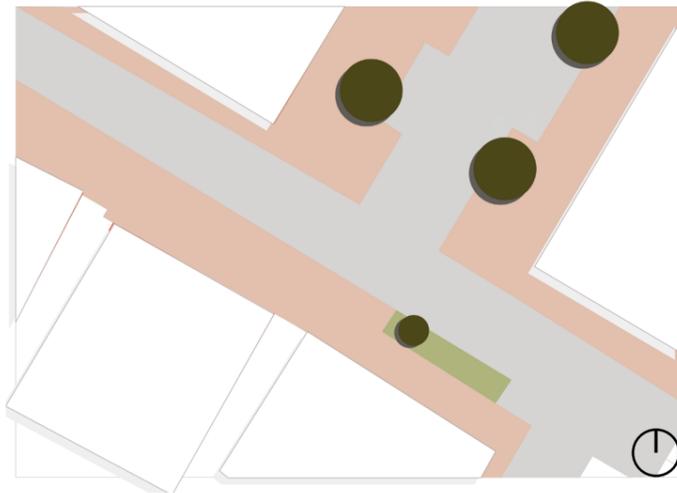
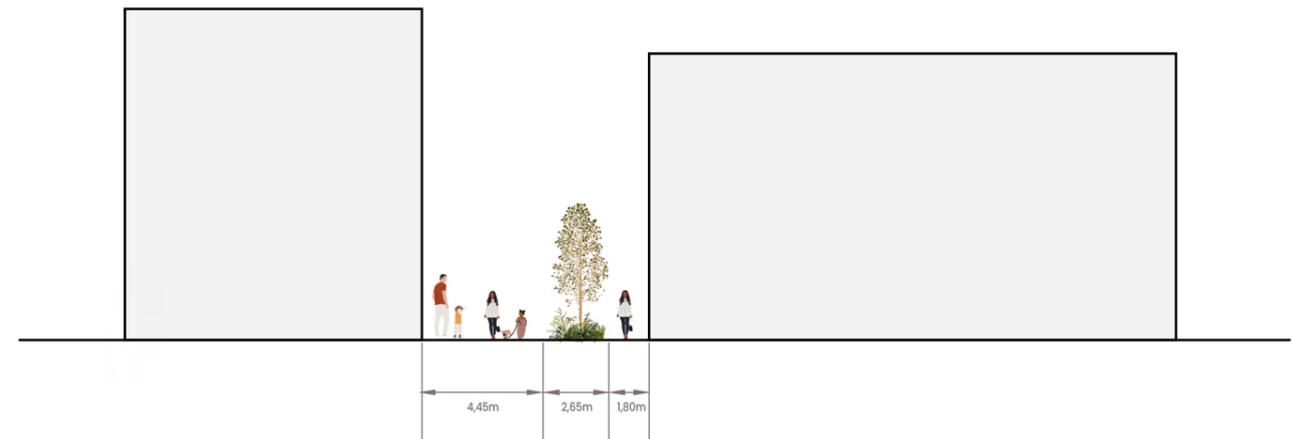
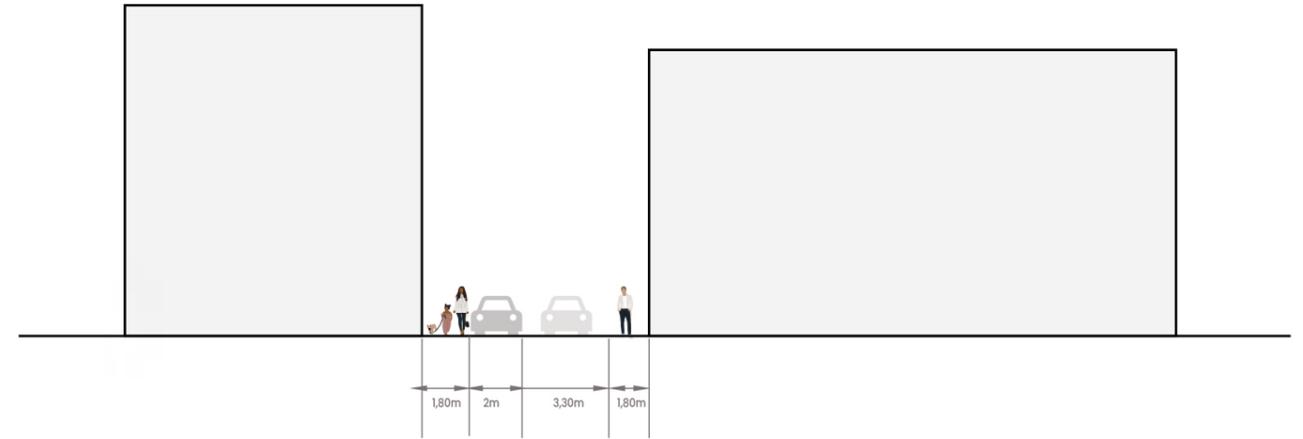
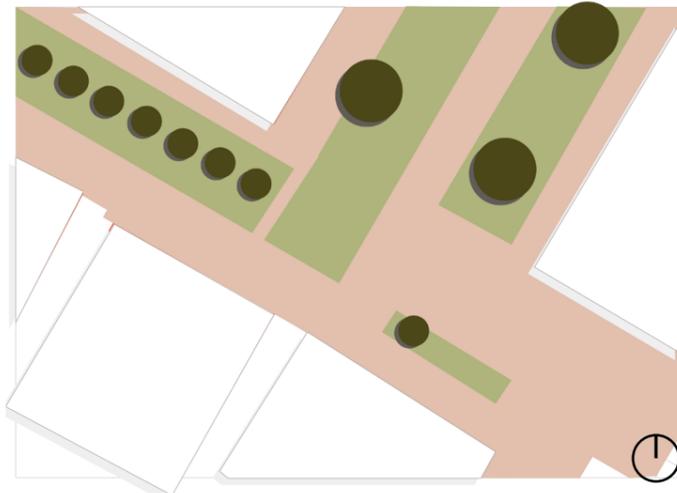


Figure 83: Hoogstraat plan + section - after

Source: Author



Street Design of Hoogstraat



Figure 85: Impression of Hoogstraat in 2100
Source: Author

6.3 Assessment & Conclusions

6.3.1 Evaluating the design proposal

In order to be able to evaluate the outcomes of this project, an evaluation framework was created, based on the Eisenberg's conceptual framework for social sustainability (Eisenberg & Jabareen, 2017).

Establishing the design principles helped unpack the component of the project and the 3-30-300 rule and what direct impact this rule has on several layers and aspects of the urban environment.

In the diagram, you can see how the evaluation framework is structured, as well as, the criteria on which the evaluation of the design proposals and the masterplan overall will be based on.

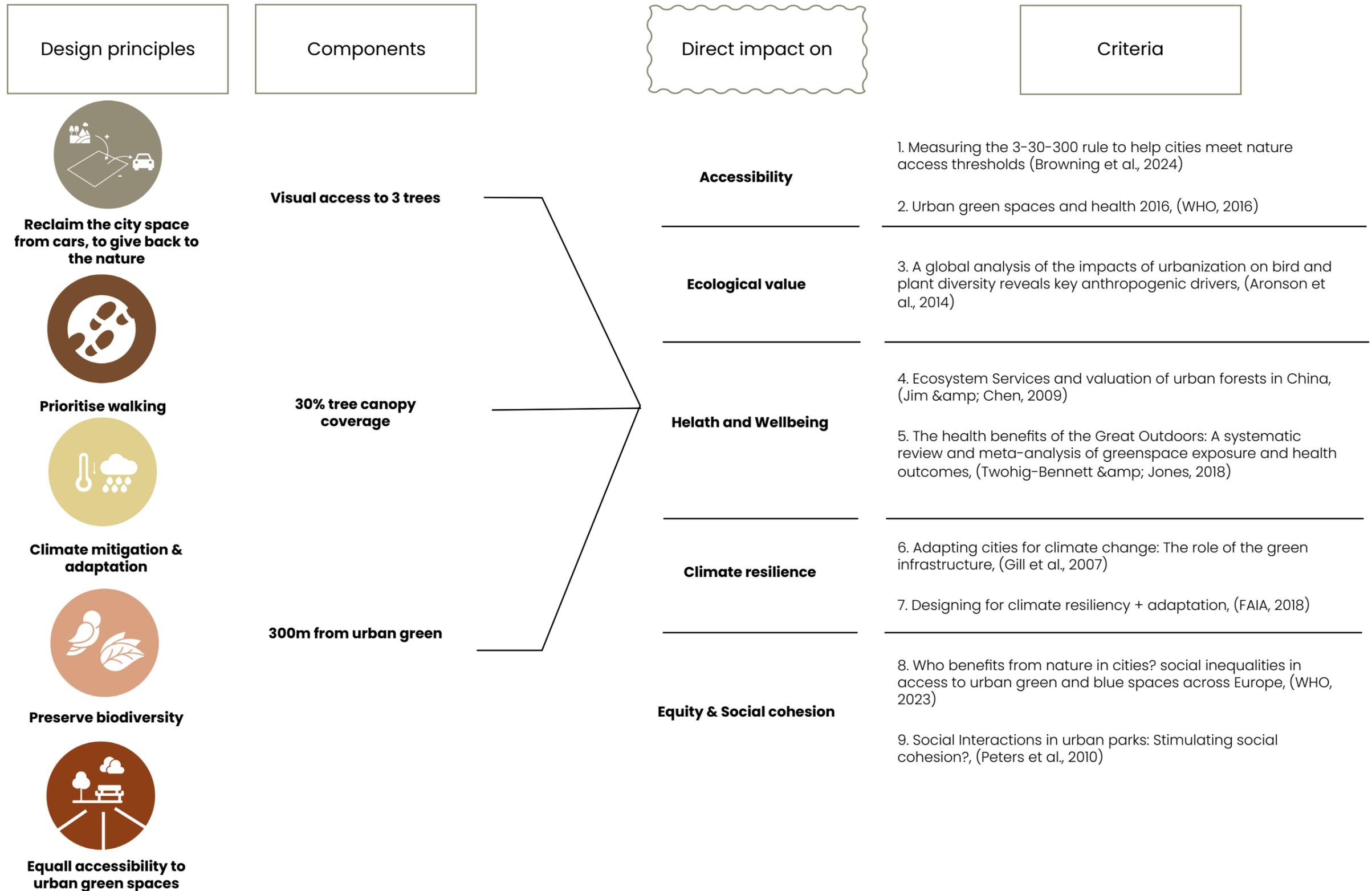


Figure 86: Evaluation framework

Source: Author

6.3.1 Evaluating the design proposal

Based on the nature of the criteria the proposed designs seek to evaluate, and based on the Eisenberg's conceptual framework for social sustainability, a table of scoring criteria was created (Eizenberg & Jabareen, 2017).

With the use of the scoring criteria, a holistic evaluation assessment can be made for the proposed design intervention, and understand what that would mean not only for the people but also the environment. Furthermore, this method provides clear and actionable metrics, with the 0-5 scoring system, and it makes easier to identify weaknesses and strengths of this project.

Additionally, this scoring system can work also as a guidance for decision-makers, as it highlights where the project excels and where it needs improvements. Each score can let the decision-makers to see which aspects need more in depth investigation, focus and resources.

Scoring criteria

Score	Explanation
0	No consideration or evidence of the criteria
1	Very minimal or poor consideration of the criteria
2	Some consideration, but significant gaps in the implementation of the criteria
3	Moderate inclusion of the criteria, but with some weaknesses
4	Strong inclusion of the criteria, with minor gaps
5	Excellent and comprehensive inclusion of the criteria

Figure 87: Scoring criteria of the evaluation framework
Source: Author

6.3.1 Evaluating the design proposal

In the re-design segment of Lijnbaan, the scoring has been developed based on the Eizenberg & Jabareen, (2017) conceptual framework on social sustainability.

Evaluation criteria in the previous pages have been structured, based on which the evaluation will be conducted.

The slight differences in the score depend on the width of the street as well as its opportunities in terms of tree planting and left space for people and society.

These differences can be used to better implement specific functions on re-designed streets, but also understand on which "weakness" to focus and try to come up with a way to balance these out with the strengths.

3 trees	■ ■ ■ ■ ■	every windows facing the street can see 3 trees
30% canopy coverage	■ ■ ■ ■ ■	30% canopy coverage is achieved in the street section re-designed
300m from urban green	■ ■ ■ ■ ■	300m from urban green of small size
Accessibility	■ ■ ■ ■ ■	immediate accessibility to green
Ecological value	■ ■ ■ ■ ■	Creation of habitats for insects, animals & plants. Depends on the species of the tree, their maintainance and health.
Helath & Wellbeing	■ ■ ■ ■ ■	Can only be measured and assesed after interviews and/or questionairs
Climate resilience	■ ■ ■ ■ ■	Achieves some cooling and shading, whilst the rainfall catchement depends on the soil depth and tree species
Equity & Social cohesion	■ ■ ■ ■ ■	Equally accessible urban green space on the street, tho it is not guranteed that social cohesion will be achieved immediatly.

3 trees	■ ■ ■ ■ ■	every windows facing the street can see 3 trees
30% canopy coverage	■ ■ ■ ■ ■	30% canopy coverage is partially achieved in the street section re-designed
300m from urban green	■ ■ ■ ■ ■	300m from urban green of small size
Accessibility	■ ■ ■ ■ ■	immediate accessibility to green
Ecological value	■ ■ ■ ■ ■	Creation of habitats for insects, animals & plants. Depends on the species of the tree, their maintainance and health.
Helath & Wellbeing	■ ■ ■ ■ ■	Can only be measured and assesed after interviews and/or questionairs
Climate resilience	■ ■ ■ ■ ■	Achieves some cooling and shading, whilst the rainfall catchement depends on the soil depth and tree species
Equity & Social cohesion	■ ■ ■ ■ ■	Equally accessible urban green space on the street, tho it is not guranteed that social cohesion will be achieved immediatly.



6.3.2 Evaluating the Masterplan

An overall evaluation of the masterplan of Kamperpoort has been conducted, in order to understand what the strengths of the proposal are, the weaknesses, but also the application of the rule and its feasibility.

As this proposal incorporates the already existing development of the two masterplans in the West side and North side of Kamperpoort, the 300m accessibility to an urban green area >1ha, as well as the 30% tree canopy coverage of the neighborhood are met.

If not taking into account the masterplans, then the both of the aspects before are not met. In this situation, indeed, the transformation of these areas would be needed, as they occupy half of the neighbourhood and consist 90% of paved spaces.

Figure 90: Evaluation of Masterplan

Source: Author

3 trees		every windows facing the street can see 3 trees
30% canopy coverage		30% canopy coverage is achieved in the street section re-designed
300m from urban green		300m from urban green
Accessibility		immediate accessibility to green
Ecological value		Creation of habitats for insects, animals & plants. Depends on the species of the tree, their maintainance and health.
Health & Wellbeing		Can only be measured and assessed after interviews and/or questionairs
Climate resilience		Achieves some cooling and shading, whilst the rainfall catchement depends on the soil depth and tree species
Equity & Social cohesion		Equally accessible urban green space on the street, tho it is not guranteed that social cohesion will be achieved immediatly.



6.3.3 Guidelines for future applications of the 3-30-300 rule

In this sub-chapter some guidelines for future applications of the 3-30-300 rule will be listed, based on the knowledge obtained throughout this research by design project.

Contextual Adaptation

As also mentioned by Cecil Konijnendijk, it is important that the rule is adapted to each context separately and uniquely, maintaining the core values. In densely populated areas, through the rule, the people should be encouraged to create a greener urban environment also in their private space (garden, frontyard, backyard, courtyard, balcony and rooftops).

Integrating with the existing/ future Urban Infrastructure

While tree planting is crucial for the creation of better living conditions, if not planted correctly, can cause extensive damage to both underground and ground infrastructure (cables, pipes, pavement, buildings etc.). In order to avoid that, either consider not planting on areas where the majority of infrastructure is located, or provide alternatives way of greening the area.

While moving towards the future, as trees and nature become an important part of our urban environment, the underground infrastructure will need to be replaced at some point. Guidelines should be created for the replaced infrastructure to be designed and placed in a way that support the system of trees with bigger routes.

Strategies regarding Climate Resilience

The implementation of the rule should aim for the incorporations of native species into the selected site. Furthermore, the canopy coverage should be planted in areas and in a way it can adapt to local conditions and become part of the existing green infrastructure.

Equity in the distribution of urban greenery

It is important that every citizen has equal access to green public spaces throughout the city. Thus, it is important to start the design process from neighbourhoods that do not have any green public space, or the one they have is not of quality and size.

Also, it is important that these green public spaces are accessible by every age group, has seating areas, playgrounds and provides enough space for people to use appropriately.

Tree planting

Tree planting strategies are recommended to be executed with software that can calculate the impact of every chosen tree to the area.

Community Involvement

Start from the community. If the community understands, then stakeholders also may be convinced. The 3-30-300 rule provides a stage for people to count and observe the environments they live in, in order to understand what this environment has to offer. Participatory design workshops are essential, because they ensure that everybody can raise questions and problematisations or ideas that contribute to the overall design process.

Long-term Maintenance and Assessment

The long-term maintenance of the trees is vital in order to them to contribute in a positive way to the urban environment. Plans should be made regarding the pruning and soil nutrient measurements. Healthy trees shape healthy cities and societies.

Integration with Urban Planning

The 3-30-300 rule should not exist in isolation but rather be seamlessly integrated into existing urban planning policies. This includes incorporating its principles into zoning laws, sustainability initiatives, and housing development projects. By requiring urban development and infrastructure projects to comply with tree canopy goals, green space proximity, and visibility from residential units as part of the planning approval process, cities can ensure that greening is an integral part of all urban development.

Economic Incentives

To encourage widespread adoption and implementation of the 3-30-300 rule, cities can leverage economic incentives and explore diverse funding mechanisms. This includes fostering public-private partnerships, securing grants, and offering incentives for private developers who prioritize green infrastructure in their projects. Tax incentives or financial rewards can motivate developers and property owners to meet the 3-30-300 requirements, making greening a more financially viable option.

Cost-Benefit Analysis

Demonstrating the economic benefits of urban greening is crucial for securing public and private sector support. Cities should conduct and promote cost-benefit analyses that highlight the long-term economic advantages of meeting the 3-30-300 rule. These analyses should quantify the positive impacts, such as reduced healthcare costs associated with improved public health, energy savings from reduced urban heat island effects, and increased real estate value. By presenting a compelling economic case, cities can garner greater support and investment in urban greening initiatives.

Chapter 8

Conclusions

In this chapter conclusions are drawn from the entire project, as well as the application of the 3-30-300 rule with the research by design method. These conclusions are a vital part of this project, as it creates a stepping stone for further exploration, analysis, and application of the rule not only in Zwolle, but also in other contexts.

8.1 Conclusions

The conclusion chapter will be formed to answer the main research question as well as the sub-research questions.

1. What is the current approach of introducing nature into the urban fabric?

The existing approach to integrating nature into urban environments is informed by a thorough review of relevant theories, policies, and frameworks. The most prevalent methods for creating urban green spaces involve the application of Nature-Based Solutions and Biophilic design principles, often guided by national or EU-level Urban Greening Policies. These frameworks are tailored to specific contexts rather than adhering to a universal “norm” or objective. In this regard, the 3-30-300 rule has been developed as an initial guideline for designers and policymakers when undertaking urban greening initiatives at the city, neighborhood, or street level.

2. What is the status quo of Zwolle’s green spaces and their impact on the citizen’s life?

Zwolle faces a significant shortage of public green spaces, with nearly half of the city’s population lacking access to such areas. This deficiency presents numerous challenges, including worsening the Urban Heat Island effect, inadequate water retention during rainfall, and potential degradation of the city’s ecosystem, which is at risk of decline. The lack of urban greenery makes Zwolle’s environmental system vulnerable, and this vulnerability extends beyond environmental factors to impact the city’s social fabric.

A substantial portion of the population is deprived of access to green spaces, creating inequities between residents who benefit from proximity to nature and those who do not. This disparity in access to green spaces marginalizes certain segments of the population, leading to social inequalities. As highlighted in Chapter 5, access to urban green environments has been shown to have a positive impact on individuals’ mental and physical well-being. Green spaces contribute to stress reduction, encourage physical activity, and foster social interaction, all of which are essential for a high quality of life.

Without access to green spaces, residents are denied these critical benefits, resulting in a decline in their overall quality of life. The absence of nature within the urban environment negatively impacts both the physical health and mental well-being of residents, contributing to higher levels of stress, anxiety, and social isolation. Thus, the lack of green spaces not only weakens the city’s environmental resilience but also deepens social vulnerabilities, creating a less sustainable and less livable city for its inhabitants.

3. How can the “3-30-300 rule” be applied to Zwolle’s context in order to integrate more nature in the city’s urban fabric?

Implementing the 3-30-300 rule effectively requires understanding its underlying principles and objectives. The rule provides guidance on essential urban design goals, such as enhancing shade, mitigating climate impacts, and creating positive environments that support human well-being. Importantly, the rule does not prescribe specific design solutions, allowing designers flexibility to determine the most appropriate approaches for a given context.

The most effective strategy for implementing the 3-30-300 rule is to focus on the streetscape as the foundation for urban transformation. Streets play a pivotal role in structuring urban life and serve as critical conduits for integrating green infrastructure. By designing a cohesive green street network that permeates neighborhoods, the benefits of the rule can be distributed across the entire city, fostering a more sustainable and livable urban environment.

In Zwolle, the 3-30-300 rule should prioritize introduction in the city’s most vulnerable neighborhoods, where green space access is limited and the urban heat island effect is more pronounced. These areas often face greater social and environmental disparities, making them a logical starting point for interventions to promote equity and resilience. Once these areas are addressed, the focus can then shift to enhancing the green infrastructure of neighborhoods already exhibiting partial compliance.

By adopting this phased approach, starting with the most vulnerable areas and gradually expanding the green street network, Zwolle can ensure the benefits of the 3-30-300 rule—such as improved climate resilience, social cohesion, and public health—are distributed equitably, contributing to the city’s long-term sustainability and livability.

4. How can the options developed with the use of the 3-30-300 rule, be evaluated ?

The project adopted a structured evaluation approach to assess the proposed designs. It used a conceptual framework for social sustainability to establish a scoring system with criteria aligned with the social dimensions of urban sustainability. This framework was systematically used to evaluate the masterplan and design proposals, with scores ranging from 0 to 5 reflecting the alignment with relevant theoretical and scientific knowledge about the 3-30-300 rule and social sustainability.

The project also conducted a SWOT analysis to evaluate design options related to tree placements and street transformations. This qualitative assessment provided insights into the potential benefits and challenges of different tree arrangements and sizes, in terms of urban functionality and environmental impact.

By combining a quantitative scoring system with a qualitative SWOT analysis, the project was able to comprehensively evaluate its design proposals, ensuring they were grounded in theoretical knowledge and practical in their application. This dual approach strengthened the overall validity of the project and ensured the designs were socially sustainable and adaptable to Zwolle’s urban context.

“What if the biophilic design strategy of Dr. Cecil Konijnendijk would be implemented in the streetscape of Zwolle to improve the existing public space by 2100?”.

The biophilic design strategy proposed by Dr. Cecil Konijnendijk could transform Zwolle into a green, healthy, and livable city by 2100. This approach would integrate nature-based solutions into the urban fabric, reshaping the streets into an interconnected green network.

This transformation would enhance Zwolle’s aesthetic and ecological value, as well as its resilience to climate change impacts. The extensive tree canopy and green spaces would help the city withstand environmental stressors, improving stormwater management, reducing the Urban Heat Island effect, and enhancing biodiversity.

On a societal level, widespread access to green environments would have a positive impact on public health and well-being, reducing stress, improving mental health, and encouraging physical activity. The project would foster greater social equity by ensuring all residents have access to green spaces, as per the 3-30-300 rule, creating a healthier and greener urban environment for all.

Moreover, the streetscape transformation would prioritize walkability and pedestrian-friendly design, reducing car dependency and promoting sustainable urban mobility. This shift would encourage active transportation and lower the city’s carbon footprint.

In conclusion, by 2100, Zwolle would become more resilient, and socially cohesive city through the full integration of the biophilic design strategy into its urban streetscape. This vision would enhance quality of life, foster community well-being, and promote environmental sustainability for future generations.

8.2 Limitations

Regarding the **limitations of this proposed design** in the project they can be summarised in the following paragraphs:

1. Space limitations

The densely developed urban context of Kamperpoort presents significant spatial limitations for extensive tree planting. The narrow streets and existing use of courtyards for parking pose challenges for large-scale tree planting initiatives, making it difficult to achieve the target tree canopy coverage of 30%.

The presence of underground utilities and extensive paved surfaces restricts the ability to plant larger tree species or provide adequate soil volumes required for their long-term health and growth. These spatial constraints can limit the selection of appropriate tree species and shape the scale and scope of green interventions that can be implemented.

2. Engaging the Community

One key limitation is gaining support from residents to convert spaces currently used for parking or other functions into green spaces. Residents may be resistant to giving up spaces they see as essential for daily life, especially if they rely on cars. Additionally, without awareness campaigns and community engagement, it may be challenging to encourage people to plant trees in their private spaces or support green interventions, as they may not fully understand the importance of climate resilience, biodiversity, and the benefits of urban greenery.

3. Financial and Resource Limitations

Funding Constraints

Implementing green infrastructure, such as large-scale tree planting, drainage improvements, and converting paved areas to green spaces, requires significant investment. The project may face limitations due to budget constraints,

lack of government funding, or difficulties securing private or public-private funding.

Maintenance Challenges

Ongoing maintenance of green spaces is another financial hurdle. Trees need regular care, including watering, pruning, and disease management. The costs and responsibility for maintaining these areas, especially in public or shared spaces, may fall on municipal services or residents, potentially limiting the project's long-term sustainability.

3. Private Property Dependence

The success of the 3-tree rule is dependent on residents planting trees in their private gardens or backyards, which is difficult to enforce or guarantee. Without widespread community participation, this goal may be hard to achieve, limiting the overall effectiveness of the green strategy.

Regarding the **limitations the project** they can be summarised in the following paragraphs:

Tree Species Selection and Suitability

The project did not conduct an in-depth analysis of the tree species best suited to Kamperpoort's specific environmental conditions. Different tree species have varying impacts on canopy coverage, shade provision, and climate resilience. Without further investigation into which species would thrive in the local context, the project may face challenges in achieving the full environmental benefits anticipated, such as temperature reduction and biodiversity support.

Soil Health and Quality

Soil health is a critical factor for the long-term survival and growth of urban trees, yet the project did not assess the condition of the existing soil in Kamperpoort. Without understanding the current soil conditions, there is a risk that newly planted trees may not thrive, limiting their contribution to the project's goals of increasing canopy coverage and climate mitigation.

Underground Infrastructure

The project did not thoroughly investigate the impact of underground infrastructure on tree planting and green space development. Without mapping out these underground structures, the potential for conflict between root systems and infrastructure could undermine the effectiveness of tree planting efforts and lead to additional maintenance costs.

Biodiversity Opportunities

While biodiversity is a key objective, there was no detailed assessment of the biodiversity opportunities in

Kamperpoort. Understanding which species of flora and fauna would benefit from the introduction of more green spaces would have allowed for more targeted planting and habitat creation, enhancing the ecological value of the project. The absence of a biodiversity analysis leaves the potential impact on urban ecosystems largely speculative.

Addressing these additional considerations could help the project achieve its full potential and ensure the long-term sustainability and effectiveness of the urban greening interventions in Kamperpoort.

8.3 Reflection

When reflecting upon the project, several questions are answered, as following:

1. What is the relation between your graduation project topic, the studio topic, your master track (A/U/BT, LA, MBE), and your master program (MSc AUBS)?

The graduation project exploring the 3-30-300 rule to improve Zwolle's sustainability, health, and livability is closely connected to the studio topic, master track, and broader master program. These elements shape the project's approach and outcomes by aligning urban theory with practical design, sustainability, and social equity goals.

Relation to studio topic

The studio's emphasis on urban fabric design complements the project by offering a comprehensive understanding of how cities are structured, utilized, and how infrastructure interacts with the urban environment. In the context of urban design, the fabric refers to the streets, buildings, public spaces, and infrastructure that shape the city's form and function.

The 3-30-300 rule directly engages with these urban design elements by restructuring the fabric to prioritize green spaces, tree-lined streets, and connectivity between green zones. It promotes the reconsideration of spaces typically dedicated to cars and infrastructure, reclaiming them for nature.

The studio's work on the urban fabric provides insights into street hierarchies, public space design, and the social functions of spaces, all of which are critical for effectively implementing the 3-30-300 rule. By focusing on spatial relationships within the urban grid, the studio equips the project with tools to transform Zwolle's urban form in a way that promotes environmental and social benefits.

Relation to Master Track

The Urbanism master program at TU Delft provides a comprehensive foundation in the design, planning, and management of urban environments, with a particular emphasis on sustainability, mobility, and public space. This project is closely aligned with the core tenets of urbanism:

Sustainability: The 3-30-300 framework underscores sustainability by addressing climate change mitigation, carbon sequestration, and the reduction of urban heat island effects. The urbanism curriculum's focus on environmental sustainability seamlessly aligns with these goals, equipping the project with methodologies to integrate green infrastructure and sustainable urban design principles.

Public Space Design: The Urbanism program teaches students to design public spaces that are inclusive, functional, and responsive to community needs. The 3-30-300 rule complements this by ensuring equitable access to green spaces, enhancing the overall livability of urban areas, and promoting social interaction within well-designed, nature-based public spaces.

Mobility and Accessibility: The Urbanism program's emphasis on mobility aids in understanding how to create pedestrian-friendly and car-free environments, a key aspect of this project. The principle of reclaiming car-centric spaces for nature aligns with urbanism's efforts to reduce car dependency and prioritize walkability and public transit.

Relation to Master Program

The Master's program in Architecture, Urbanism, and Building Sciences at TU Delft provides an interdisciplinary framework that integrates disciplines such as architecture, urbanism, landscape design, and building technology. This

multidisciplinary approach aligns well with the objectives of the project in several ways:

Interdisciplinary Thinking: The AUBS program emphasizes the necessity of an integrated approach to addressing urban challenges, which is reflected in the project's ambition to blend landscape design, urban planning, and environmental sciences. By applying the 3-30-300 rule, the project draws upon a diverse range of disciplines, including urban ecology, climate science, and public health, to develop a comprehensive strategy for greening Zwolle.

Sustainability and Resilience: The AUBS program strongly advocates for sustainable development and urban resilience. This project reflects these values by focusing on climate change mitigation, enhancing biodiversity, and ensuring the well-being of urban populations through the strategic integration of green spaces.

Design Research: The AUBS program emphasizes research-driven design, encouraging students to ground their design proposals in empirical evidence and socio-environmental analysis. The project's use of the 3-30-300 rule is rooted in both scientific literature on urban greening and environmental psychology, ensuring that the design outcomes are informed by research into the benefits of green infrastructure.

2. What is the relation between research and design in your graduation project?

This graduation project was developed with the main methodology of research by design. The proposal was also developed by design. All aspects of analysis, exploring, developing options etc. are a products of design. But all of this design comes from knowledge obtain from literature review. Every application

of design is closely related to scientific and theoretical knowledge of people that have been working on these aspect the project poses for years. Having this knowledge as backbone, the research by design is done more methodically.

In any design project, the research component is fundamental to the success and viability of the design interventions. Without a solid basis of research, the design process lacks the necessary support to justify its decisions, leading to interventions that may be unconvincing to stakeholders. Research provides the knowledge foundation that informs design choices, ensuring that each intervention is evidence-based, contextually fitted, and aligned with broader social, environmental, and technical considerations.

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

I started my graduation year knowing that I wanted to create a project that would be design based. I selected a topic that was not only crucial but also highly practical - understanding how, as an urban designer, I could reintegrate nature into the urban fabric. After in-depth analysis, I recognized a persistent gap between theoretical/scientific knowledge and the practical application of urban green strategies. While cities often incorporate greenery in their designs, this is frequently for aesthetic purposes alone. This led me to ponder the pressing question: what can be done when usable space is scarce? It is a question that reflects the reality of our cities.

With the **research by design** methodology, I was able to better comprehend the 3-30-300 rule, **develop options** regarding tree planting and green on the streets. This design-focused approach helped me better understand not only how to develop options but

also **how to evaluate them.** It provided me with knowledge and skills that were vital to be able to answer the main research question of this project.

4. How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

Urban green spaces offer a wide range of crucial benefits for creating healthy, sustainable, and thriving cities. Investing in green infrastructure yields significant returns across multiple areas, including public health, community well-being, environmental resilience, and overall livability.

Green spaces promote physical and mental well-being by providing opportunities for physical activity, reducing stress, and enhancing cognitive function. They also foster community cohesion by serving as shared spaces for interaction, recreation, and engagement with nature, particularly important in diverse and transient urban environments.

Furthermore, green spaces improve air quality through the filtering capabilities of trees, and enhance the aesthetic appeal of cities, leading to economic benefits such as increased property values, tourism, and investment.

Ultimately, investing in urban green spaces is a strategic imperative for creating healthier, more sustainable, and vibrant cities, as they contribute to a **better quality of life and a more resilient urban ecosystem.**

Equitable and sustainable urban greening requires prioritizing principles such as equity and accessibility, environmental justice, long-term sustainability, and community involvement. **Projects should ensure equitable access to green spaces for all residents, address environmental**

justice concerns, use sustainable practices, and meaningfully engage the community throughout the process. This holistic approach helps create green spaces that are truly beneficial for the entire community.

5. How do you assess the value of the transferability of your project results?

The rule's strength lies in its simplicity and versatility. Regardless of a city's size, location, or existing green infrastructure, the key principles of ensuring nearby nature, adequate tree cover, and accessible green spaces within 300m remain relevant. **Cities can tailor the implementation of these principles** to their unique contexts, considering factors such as population density, urban fabric, and local climate.

The strategies used to achieve the 3-30-300 rule's objectives, like planting trees, creating pocket parks, and developing green corridors, **are easily transferable.** Cities facing similar challenges related to urban heat, air pollution, or lack of green spaces can adapt and implement these strategies based on their specific needs and resources. Sharing best practices and lessons from successful 3-30-300 implementations can further facilitate its adoption and **adaptation in diverse urban environments.**

The 3-30-300 rule provides a flexible framework that helps cities integrate nature effectively. Its principles are widely applicable, offering useful guidance for enhancing livability, promoting well-being, and strengthening ecological resilience. **The rule's adaptability and the transferability** of its strategies make it a valuable tool for cities worldwide aiming to create greener, healthier, and more sustainable urban environments.

6. Did your initial assumptions about the project topic change as you progressed? How did your understanding evolve?

My initial view of reintroducing nature into cities focused on large-scale interventions, like expansive green spaces and ecological restorations. However, exploring the 3-30-300 rule revealed a more nuanced perspective that shifted my assumptions.

The rule's emphasis on accessibility and proximity highlighted the significant impact of even small-scale, incremental changes. I came to appreciate the importance of strategically integrating nature into the existing urban fabric, recognizing that thoughtful, modest additions can meaningfully contribute to a city's ecological integrity and resident well-being.

Furthermore, my initial perception of the 3-30-300 rule as a rigid formula evolved into an appreciation for its flexibility as a guiding framework. While the rule provides valuable benchmarks, it acknowledges the uniqueness of each urban context, allowing for nuanced interpretations and adaptations tailored to specific social, ecological, and geographical considerations. This openness to contextualization enhances the rule's applicability across diverse urban environments and encourages innovative, context-specific approaches to urban greening.

7. Did you encounter any contradictions or paradoxes while researching or working on this project? How did you navigate those?

The 3-30-300 rule's simplicity is both a strength and a weakness. While its clear and memorable message effectively advocates for urban greening, this simplicity can also lead to oversimplification when applying the principles in practice.

The rule's elegance makes it a powerful tool for engaging the public and fostering a shared understanding of the importance of urban greenery. However, translating these principles into tangible interventions requires

navigating a web of interconnected factors that the rule doesn't fully address. For example, increasing tree canopy cover may conflict with existing infrastructure, utilities, or biodiversity goals. Ensuring equitable access to green spaces can also clash with realities like land ownership and socioeconomic disparities.

Ultimately, the 3-30-300 rule is not a one-size-fits-all solution, but rather a starting point for critical dialogue and context-specific planning. Achieving the rule's aspirations demands a deep understanding of local conditions, community needs, and a willingness to engage in collaborative processes with diverse stakeholders.

Chapter 9

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